Digital Television (DTV)

Review of a Year of Unprecedented Growth

Updated at the Consumers Electronics Show (CES) 2004

By Rodolfo La Maestra January 31st, 2004

This report summarizes what is new in DTV related products, to help consumers regarding new purchases and upgrades of DTV technology, and with emphasis on HDTV.

It is also a follow up of the CES 2003 report; most models appearing on that report are still available to consumers. During the year, several announcements and events took place (such as CEDIA in September) to introduce some new models not shown at CES 2003.

Rather than providing the new information as a full jump of one year wrapping at CES 2004, all new products are highlighted with the date when they were introduced, in addition to the products announced at CES 2004, which are planned for release throughout 2004/5.

In other words, in order to have a broader picture of all DTV products available, discontinued, current, and future (as announced at CES 04), both reports should be consulted together. This makes this CES 2004 report more manageable to readers that just want to know the new products (or recently released). Most publications show tables with only current DTV products, and with limited information on the specs.

Hundreds of DTV related pieces of equipment are included on this report, with specifications and features that could facilitate comparisons with other models. The report also highlights manufacturing trends on adopting or abandoning certain technologies (such as the dramatic increase of flat panel displays relative to last year, and relative to CRT).

The report assumes that the reader has some basic knowledge of DTV; some of the technical information provided might seem overwhelming to readers that feel the need to understand the basics first. For that purpose, some links with basic information are included in

the CES 2003 report. Additionally, the reader might want to become familiarized with DTV by consulting tutorial articles on HD publications, such as the HDTVetc magazine.

All types of display monitors and integrated DTVs are covered on this report, such as RPTV (rear projection), FPTV (front projection), Plasmas (PDP), DLP, LCD, LCoS, D-ILA, etc).

It also includes a follow up of how digital video connectivity (DVI, HDMI and IEEE-1394 Firewire) is being implemented by manufacturers. It reviews the status and lists all DTV related equipment such as D-VHS VCR (and D-Theater), High Definition DVD for playback/recording, HD tuners for small-dish satellite, digital cable, and over-the-air (OTA) w/antenna reception, and HD PVRs (Personal Video Recorders also known as DVRs).

Not included in this report are DTV displays below the size of 40" diagonal and 4x3 aspect ratio (except for a few), computer related HD-tuner cards, computer Hard Disk Drives (HDD) for storage of HD video (similar to an HD Tivo PVR, but using a computer), C-Band (big dish) satellite equipment, and some after-market modifications to HD-Set Top Boxes (HD-STBs) for DBS small-dish satellite HD recording (such as 169time.com).

To the extent that was humanly possible, all the information about models, prices, and specifications has been confirmed with products demonstrations, lab tests, industry press releases, technical articles, and manufacturer interviews held at CES.

Although considerable effort was made to consolidate and verify the accuracy and completeness of the large amount of data included on this report, this writer cannot assume responsibility for omissions or errors. Any information you might want to contribute to correct or enhance the usefulness of this report would be certainly welcomed. The objective is to help the consumer, we all are.

Quoted prices are in MSRP US dollars as announced by the manufacturer at the time of product release/announcement. Some products are also quoted with a "street $" when such price is known.

The term TTM is used to express product availability ("Time To Market"). Products introduced recently (a couple of months ago) could also be indicated as TTM "current", although most consumers will consider them as new products; new products prototyped at CES are quoted as announced by the manufacturer with either a projected TTM date or as TBA "To Be Announced".

The specifications of input/output connections focus primarily on DTV and HD video connectivity, such as broadband analog interfaces (component YPbPr, RGB/HV, VGA 15 pin D-sub), or digital interfaces, such as IEEE-1394 Firewire for compressed HD video, or DVI (Digital Visual Interface) and HDMI (High Definition Multimedia Interface), for uncompressed HD video.

For its second year, the DTV industry is aggressively incorporating DVI digital interfaces (some even including the newer HDMI) on DTV related equipment, and also including 1394 outputs on most OTA DTV tuners (and HD-STBs) to facilitate HD recording and networking (although unfortunately that is not the case, for another year, with DirecTV HD-STBs).

According to a recent statistic of the Consumers Electronics Association (CEA), there are now about 8.9 million HDTVs sold since 1998. A large percentage of them are legacy displays that do not have digital interfaces (they have only component analog interfaces). The implications of the lack of digital interfaces are covered of the CES 2003 report http://mysite.verizon.net/rodolfo.lamaestra/index.htm

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Brief Highlights of CES 2004

Panels, panels, all kinds of them, check the 70+ inches from LG on the plasma section and the 80 inches Samsung model. All the big ones come with 1920x1080 resolution already, and spectacular images.

50" plasmas coming down to the rock bottom price of $5,000, like the new V, Inc. P50HD; or the low price units from Akay, Gateway and Daewoo on the same size.

Check also the new LCD TV panels on the first DTV section as well; they are now coming in large sizes (Sharp's 45, Samsung's 57 inches), and 1920x1080 resolution.

There were some announcements of company decisions, like Toshiba dropping LCoS due to chip unavailability to meet the delivery of sets of the current line, and Pioneer shift for the support to plasmas, possibly dropping CRT RPTVs. Pioneer said that the company would review the situation again in 2005, but it looks as the action from Pioneer has happened already, for their first time, there were no Elite RPTVs at the show. Most manufacturers announced new models of CRT RPTV for the coming year; this CRT tradition is not going away anytime soon.

DVI is growing fast, HDMI is coming but slow, DVI/HDMI switching in pre/pros and receivers is lacking support, DVI/HDMI multiple inputs in HD displays is mostly absent; Silicon Image developed a new pair of HDMI ICs for dual inputs, this helps, so we could hope to see new products with at least two HDMI inputs on their back panels in late 2004/early 2005.

Having many devices with DVI or HDMI and no switching (unless a separate switcher is installed on the audio/video system) is starting to become a problem, especially now with the new DVD players that upconvert to HD but on the DVI/HDMI output only. Check all the new models later on the report.

The CableCARD was shown at CES (left), still with unidirectional QAM tuner features only; it is appearing on many new integrated sets and some new cable STBs from Motorola and Scientific Atlanta for 2004. Digital cable is finally joining the HD crowd.

Some low cost EDTV projectors from Optoma and BenQ using DLP technology are becoming to appear, and appeal to low budget home theater enthusiasts; like the Optoma H30 (on the right) for $1,400 (not HD, but a great image), and BenQ's PB6100 for $1,000; check the new models on the DLP section, which includes a DLP feature article.

Texas Instruments' DLP 1080p for consumers is finally here, new models are planned for 2004 from Samsung, using the new xHD3 DMD chip; it is a single-chip with color wheel implementation for now, but 3-chip ultimate quality is expected to follow. Samsung estimated

that prices would be in the $4,000 to $6,000 range for 50 to 61 inches RPTVs, appearing in July 2004. The 1080p implementation in FPTV comes late in 2004.

DirecTV announced two new STBs but without 1394 for external D-VHS recording. One is the RCA DTC210 for $600, TTM 1Q04 (on the left). DirecTV is going thru another year with no external HD recording capabilities. They announced that now they will control STB distribution themselves; so all STBs would look and behave alike, with that, gone will be the creativity benefit for consumers regarding STB features, connectivity, and user interfaces brought by competition of the pass 5 years of STB manufacturing.

The other DirecTV STB is the Hughes HD-DVR250, coming April 2004, the long awaited PVR, for $1,000, no 1394, but at least with PVR time-shifting Tivo capabilities.

The Dish Network 921 (two year old prototype) is finally here as a finish product (right photo); as well as its JVC sibling; both with Fire Wire 1394 'jack' (to be made operational in the 'near future', but that is much better than no jack at all). The unit is a PVR with multiple satellite/ATSC tuners. Check the chapter about HD-STBs to see all the new models, including QAM cable STBs.

High definition DVD is finally here in 2004 as well; Samsung and LG announced new models to be available later this year in the Blu-ray format, check the dedicated chapter, with the many photos of the new products (a Blu-ray prototype from Sharp on the left).

On that chapter, checkout also the new Chinese EVD format and player (and price!), and know about the company behind the product. Do not miss the WMV HD format from Microsoft, and the first stand-alone HD player using the format, implemented by V, Inc. (the Bravo D3 HD player) to be available on the 2Q04, for $350?

More DVD players are upconverting 480i NTSC DVD to HD. On the last CES there was only one (Samsung 931), then the Bravo D1 came to challenge, both at very low prices, now there are over a dozen models announced to appear later this year, all upconvert to HD, but there is a catch, they do the upconversion "only" over the DVI/HDMI outputs.

Therefore, if you are one of the five million-plus legacy HDTV owners out there, with only analog component inputs on your set, you are out of luck with any of these new products. The new models from Samsung will be available on the 3Q04 (the 941 that replaces the 931 is on the right). Check the dedicated section.

VOOM HD satellite service is here since October 2003; their presentation at CES had a demo of their future Motorola 580 PVR network with thin-clients around the house (using the home's coax wiring?). They are also moving to MPEG-4 compression later in 2004.

The company showed a good spirit to help current customers upgrade from their current 550 model to the newer box, perhaps by paying the difference; they disclosed no plans yet, just

spirit, but most others do not even have the spirit to offer anything for exchange-upgrades. Check the full coverage of VOOM's hardware and programming later on the report.

In summary, the DTV growth shown at CES 2004 was overwhelming, and very convincing that HDTV is strong and here to stay. This is good for everyone.

Now, spend your money wisely; and do not forget to check the articles about integrated tuners and QAM unidirectional CableCARD tuners later in the report; educate yourself to make the right choice of equipment for your tuning needs before you sign that check.

Enjoy the report.

Update on the DTV Deployment – FCC plan for OTA and Cable

Brief Summary of the DTV Plan

The original plan for DTV targeted the ending of analog broadcasting by 2007. The FCC provided each station with one additional 6 MHz channel slot so they can broadcast their current analog channel and the DTV version of it simultaneously during the transition period.

By 2007, or when 85 percent of the nation receives DTV, each broadcaster is expected to return to the FCC one of the two channels lent for the transition. That space on the spectrum would then be available for auction by the FCC.

TV stations had until April 2003 to ensure that 50 percent of their analog programming is simulcast on the digital channel. The quota rises to 75 percent in 2004, and 100 percent in 2005.

Market Penetration of DTV

In January 2003 a projection from the CEA showed that 2.7 million of DTV products would have sold in 2002 alone, 4 million would be sold in 2003, 5.4 million in 2004, 8 million in 2005 and 10.5 million in 2006. There were then approximately 4 million HDTVs sold since 1998.

In October 03, the CEA reported the year-to-date DTV with an increase in market penetration because of strong sales in the plasma and liquid crystal display (LCD) monitor categories. The year-to-date DTV sales actually reached over 2 million units in the period of January-August 2003, representing $3 billion dollars of DTV investment. DTV unit sales increased by 26 percent in August compared to August 2002, 18 percent in dollar revenues.

Regarding HD-set-top-boxes (HD-STBs) January through August 2003 showed also 148 thousand units sold, an increase of 376 percent in August 2003 compared to the same month in 2002. August 2003 sales alone totaled approximately 26,000 units. The cumulative DTV set-top box sales figure - sales from 1999 through June 2003 – was close to 400,000 units. That brings ATSC-receiving products, including both integrated sets and stand-alone set-top boxes, to over 700,000 units.

From the introduction of DTV until August 2003, DTV product sales totaled about 6,800,000 units, a dollar investment of almost $12 billion. CEA Market Research projections at Oct 2003 updated the estimate of DTV products sales as 4.3 million DTV units will be sold in 2003, 5.8 million in 2004, 8.3 million in 2005, 11.9 million in 2006 and 16.2 million in 2007.

A CEA consumer's survey for DTV made available in October 2003, stated – *"9 million households are likely to purchase HDTV products over the next 18 months and another 30 million consumers consider themselves likely purchasers within the next three years."* According to the FCC, in October 2003, 1061 television stations (equivalent to 81% of all commercial stations) are now on the air with a DTV signal.

In January 2004, an industry forecast service estimated that by the end of 2007 approximately 6 million households would be watching HDTV broadcasts from an antenna, and another 30 million will be watching HDTV by using either digital cable or satellite.

According to the CEA, the total number of DTV shipments to retailers on the full year 2003 was 4.1 million, approximately 63% higher than the 2.5 million sold in 2002. This brings the total number of DTVs sold since their introduction in 1998 to 8.9 million.

HD Programming Available – A Year of Announcements

A year ago and during 2003 the HD programming available included CBS, NBC, PBS, ABC, HBO, Showtime, HDNet, Discovery HD Theater, and HD-PPV. Their programming varied from just some prime-time selected content (NBC, ABC, and CBS), to the 24x7 of PBS, HBO, Showtime, HDNet, and Discovery HD Theater. HDNet announced plans to add more HD channels.

HD-ESPN was introduced on the second quarter of 2003. Although the network is showing true HD only for certain games (27 2hr events expected for the entire March 04, for example), most of the daily content is of NTSC quality expanded to fill the 16x9 screen with a full mode aspect ratio.

Neither the ESPN non-HD image quality, nor the chosen aspect ratio, is acceptable as a HD viewer. For such non-HD content, it is usually better to tune to the regular ESPN channel and expand the aspect ratio of the program using your TV/STB, rather than been imposed by the network.

ABC continues to broadcast their HD programming in 720p. Fox had initially chosen to broadcast in SD (480p) but they have announced that they will switch to HD 720p for 50% of their prime time schedule during 2004/5.

NBC and WB are expected to increase their programming with new series in HDTV. Except for ABC and now Fox, all of the remaining networks had chosen 1080i, although some affiliates, that are not yet suited to repeat at 1080i resolution, might down-convert some of the feeds.

On July 2003, DirecTV started a new HD package, which added ESPN HD, Discovery HD, in addition to PPV movies and special events HD channels and the existing HBO, Showtime and HDNet channels.

Back in August 03 more HD channels were announced "to become available soon", as follows:

A&E Television Networks plans HD in the future,
Bravo HD+ HD by July 31, 03
Cinemax HD in 2003, mirror of regular Cinemax
Starz 3 new HD, by Dec 03. Starz Sharper Movies part of new tier, commercial free movies 1080i/16x9 w/ DD 5.1, marketed separate from other packages
Starz HD 1080i, 16x9 w/DD 5.1 with upconverted films for cable and satellite east/west feeds, at no extra cost to Starz providers.
Starz on Demand (SVOD) 100 movies each month 1080i, 16x9 impulse viewing of Starz Encore movies with full PVR functions like pause, visual fast forward and rewind

Starz also released a widescreen 480i channel (called Starz Hi Res) 16x9 with DD 5.1, available for free to cable and satellite, and offered as an alternative to HDTV without the expense of HDTV equipment and HD cable boxes.

Dish Network announced new channels on Sep 03; the new channels will be broadcast on 110 for now. The HBO, Showtime, Demo & special events will continue on 61.5 until the roll out of Super Dish.

In the 3Q03, Showtime Networks announced it would launch its second high definition television (HDTV) channel, The Movie Channel HD, on December 1, 2003. The company will transmit an East Coast feed of Showtime Networks' all movie service in 1080i.

DirecTV announced at CES (Jan 04) that they would be adding CBS-HD and Fox-SD/HD by Feb 04 for the Super Bowl telecast. CBS was added, but was made available only to subscribers of certain of areas; otherwise, a waiver is required from the CBS affiliate for subscribers that have clear CBS OTA reception via an antenna.

Fox was not added yet (as of Feb 04), and DirecTV does not know when that will be done, but probably would be under the same waiver conditions experienced with CBS, which means no Fox in a large number of cases.

INHD service

In May 2003, a new HD 24/7 television network named INHD (owned and operated by iN DEMAND) announced its start with college sports, several hundred hours of movies, professional sports, and general interest entertainment programming.

At launch, there were 12 hours of unique programming daily repeated throughout the day and later in the week. The INHD launched in September 2003 was the first of several linear HD television channels being planned. The company said that the content is in wide screen, high-resolution format, and features Dolby Digital 5.1 audio when available. INHD is working with major digital file-server vendors and set-top manufacturers to deliver its HD content in the 1080i format.

In June 2003, INHD announced the launch of a second high-definition television channel (INHD2) featuring movies, sports, and general entertainment in September. Both channels will be 24/7, linear-programming, not PPV or VOD.

On July 2003, INHD announced their agreement to provide HD coverage with The Tennis Channel, a 24-hour cable television network devoted to tennis and other racquet sports. The network features major tournaments including ATP Tour, WTA Tour, Fed Cup, Davis Cup, etc., tennis instruction, legendary matches, in-depth profiles of greatest players, analysis and news, the latest on equipment and tennis getaways.

VOOM HD Satellite Service (programming)

Cablevision's Rainbow DBS satellite service division announced on Oct. 15, 2003 that in the 4Q03 it would launch a new HDTV-intensive satellite television service (called VOOM). The service offered a base of 39 high-definition channels, including 21 exclusive HD channels from Rainbow Media, 18 channels of digital music, 40 SD regular channels (to become 88 of popular cable channels in standard definition in Feb 04).

VOOM Motorola’s STBs also have ATSC and NTSC terrestrial tuners to receive over-the-air digital and analog TV channels, and are sold by Sears with a dish and an antenna for local

broadcast channels. Local channels would be integrated within the same user interface. VOOM would initially broadcast in MPEG-2, with an eventual "customer easy" upgrade to MPEG-4 for 3Q04, to enable the broadcast of more than 200 channels, including at least 39 HDTV services.

The service would cost about $40 x month for basic service, with a free preview offered until the end of 03. HBO would likely be added on January 04 (two HD feeds), as well as Playboy TV. The company announced that it would also add NFL Network and Discovery HD Theater.

Details about equipment requirements and capabilities are included on the HD-STB section (later on the report).

The FCC Implementation of the OTA Tuner Mandate and the Cable Agreement

HDTV Integrated Tuners

The cable and consumer electronics industries are moving towards integrating over-the-air (OTA) and cable HD tuners into HDTV sets. It is certainly good news that the cable industry is finally getting on board of HDTV.

Since about 70% of TV viewers subscribe to cable, this has the potential of accelerating the adoption of HDTV in general, at a pace we have not seen over the last 5 years. The integration of tuners into TVs seems to be an attractive proposition for everyone.

This section of the report analyzes the subject to help you decide what is best for you. Let us start with some background regarding OTA and cable tuners, mandates, agreements, and the FCC:

DTV Over-the-Air ATSC Tuners (require an antenna)

In 2002, television manufacturers and retailers were asked to adhere to a phased-in schedule that would lead to terrestrial OTA DTV tuners in all television sets by Dec 31, 2006.

The FCC then mandated that all TV sets 13-inches and larger and other products that normally carry TV tuners –such as VCRs, personal video recorders, etc.- are to include ATSC terrestrial DTV tuners by July 1, 2007.

Under the five-year phased-in guidelines DTV tuners are to be added to 50 percent of sets measuring 36 inches and larger by July 1, 2004, and 100 percent by July 1, 2005. After that, 50 percent of sets measuring 25 inches to 35 inches are to add DTV tuners by July 1, 2005, and 100 percent by July 1, 2006. The rest are to conform by July 1, 2007.

At that time, the Consumer Electronics Association (CEA) charged the decision would put an undue cost burden on consumers and filed a lawsuit to overturn the order in October 2002. One main factor for such appeal is the fact that approximately 70 percent of TV viewers receive their signal from cable, and those will be switching to a DTV cable set top box, not needing the DTV over the air tuner mandated on their new TV sets.

According to the CEA "*Manufacturers will remain free to sell true monitors without a DTV tuner as long as they do not have NTSC tuners included (underline added), as many plasma displays and front projectors are sold today. Should the regulations remain in place, TV makers have the option of building sets with both digital and analog tuners or no tuner at all (underline added). The rules do allow companies to bundle an add-on digital tuner in a separate box, which would allow the sale of today's so-called DTV-ready sets".*

The matter has been settled recently, the CEA petition was denied by the U.S. Court of Appeals in November 2003, the CEA and the manufacturers are studying the ruling. The mandated OTA tuner integration is occurring. Additionally, cable tuners are to be included as follows.

DTV Cable-Tuners

On December 2002, an announcement was made of an agreement between the consumer-electronics and cable television industries regarding digital cable interoperability as follows:

"The agreement is part of a broad 'memorandum of understanding' between the two industries that is intended to lead to a 'plug-and-play' standard that was needed to link digital cable equipment and services with consumer electronics devices. Once the Federal Communications Commission approves the agreement, it is expected to help speed the adoption of HDTV.

The memorandum, along with a letter to FCC chairman Michael Powell, was signed by 12 consumer electronics companies and seven major cable multiple system operators (MSO) representing more than 75 percent of all cable subscribers. The memorandum is a package of voluntary commitments, specifications and proposals for rules covering digital television (DTV) cable hardware compatibility and content protection, and the FFC is expected to approve the recommendations".

The plan includes the phased-in use of two digital interface connectors on new digital cable-ready TVs and/or cable set-top converter boxes, including a) IEEE-1394 'FireWire/iLink' connections with Digital Transmission Content Protection (DTCP) for recordable and networkable compressed video streams, and b) the non-recordable DVI/HDMI with High-bandwidth Digital Content Protection (HDCP) connections on digital televisions and cable set-top boxes.

The agreement prohibited cable providers who supply STBs with both FireWire and DVI/HDMI connectors to switch the outputs in order to restrict lawful recording. The agreement also included encoding rules to copy freely, once or never depending on the content.

Consumers would buy TVs from a retailer, then receive a POD (Point of Deployment) authorizing card from their cable provider which would "unlock" specific cable programming services offered by the local system. The tuner should be plug-and-play compatible <u>even if the TV moves to another location in the US</u>.

The two groups agreed to launch a "test suite" for the unidirectional digital-cable products that will begin on Jan 31, 2003.

The proposed agreement originally specified that, by Dec 31, 2003, a cable company is expected to replace any leased HD-STB that does not include a 1394 interface with a box that has one, or to provide the software that would make such an interface functional, at no cost to the consumer. The approved agreement has been extended, more on it later.

The agreement was made for an integrated <u>one-way only</u> digital cable television tuner. Under this unidirectional agreement, bi-directional features that require a return-path of the cable system, such as video-on-demand (VOD), impulse-pay-per-view, and the use of cable-operator enhanced electronic program guide services, provided by the Cable Operator, would <u>not</u> be available, and a separate STB would be needed for those integrated TVs.

The two industries also agreed to work together on standards for future interactive, 'two-way' digital cable TV products. Samsung announced in January 2003 at the Las Vegas CES that it has become the first consumer electronics manufacturer to sign a license with Cable-Labs for a <u>two-way</u> interactive version of the POD.

By implementing this interactive version of POD, digital televisions would eventually be able to directly receive interactive digital programs without the need for a digital set-top-box from their local cable provider.

How this Cable Plan was Approved in 2003

In August, the FCC announced the updated progress in the establishment of the two-way interactive plug-and-play cable interoperability agreement. Under this two-way interoperability agreement, sets with interactive functionality will be labeled "Interactive Digital Cable Ready."

Digital TV sets capable of displaying one-way programming services, including premium channels, would be labeled 'Digital Cable Ready', and they require smart POD cards that will be supplied by cable TV operators to unlock scrambled channels. The POD card is now called "CableCARD."

In September, the CEA announced that the FCC reached a decision on the plug-and-play cable agreement, as follows:

"Digital cable ready HDTV owners will be provided with a secure CableCARD to be inserted into the digital receiver in order to comply with varying degrees of content copy protection levels and prevent theft of cable service. For instance, at least one copy of a digital channel sold by monthly subscription (e.g. basic and HBO) may be made for private and personal use, whereas premium pay-per-view and video-on-demand programs may be marked as copy never (originally as copy once). Free over-the-air broadcast signals may be copied freely, and may not be reduced in resolution ("down-res'd") when output from unprotected high definition analog ports."

"Significantly, legacy DTV set owners also are protected by this agreement, which bans the use of "selectable-output-controls," which would have enabled content providers to control content delivery to households from the head end. Without the plug-and-play agreement's encoding rules, consumers who purchased introductory HDTV sets not equipped with copyprotection-designed digital outputs could be disenfranchised and altogether denied HDTV services and programming. This agreement ensures that today's DTV products will not be made obsolete in the course of a transformation to nationwide digital video delivery over cable. <u>But selectable output controls may some day in the future be used.</u>" *(Underline added).*

All digital-cable-ready TV sets are required to include over-the-air ATSC tuners. The satellite industry was not a party on this FCC decision and declared that it is not the end of the process.

Under the approved rules, and as agreed and mentioned before, HDTVs with unidirectional cable tuners would still need a set-top box for two-way services such as Video-On-Demand (VOD), Impulse Pay-Per-View (PPV) programming and cable-operator enhanced electronic programming guides. Starting April 1, 2004, cable operators must supply, upon request, HD-STBs with functional 1394 "Firewire" connectors. By July 1, 2005, all HD-STBs would also require a Digital Visual Interface (DVI) or a High Definition Multimedia Interface (HDMI).

CableCARD

According to the agreement, by July 2004, digital cable operators are to provide a CableCARD to subscribers that request one. Motorola is already testing their CableCARD with most set manufacturers and have enough CARDS for the starting, and operators have few as well.

For operators to been able to work with CableCARDs they have to upgrade their equipment (video controllers, software, billing system, etc), and some industry analysts say that the cable-company would have to send a cable tech to the subscriber's place to install and activate the card, as well as confirming that the HDTV performs as expected. Perhaps the actual implementation could be easier when the time comes.

According to Cox, they have ordered CableCARDs from Motorola and Scientific Atlanta to start testing in two eastern markets (Pensacola, FL and Orange County, CA).

Comcast plans to introduce their CableCARD in St. Paul, Minnesota and Portland, Oregon; distribution is expected to take place via professional installations.

The expected cost to customers would be similar than an HD-STB rental, which could entail a small installation fee and a Card rental. Some small cable operators estimate that their cost for a CableCARD could oscillate between $30 and $90, volume would certainly affect such pricing, however, the actual cost of a CableCARD has not yet been disclosed.

These are unidirectional tuner/CableCARD implementations. As mentioned before, they lack bi-directional functionality. Providing bi-directional capabilities on integrated HDTVs equipped with CableCARD tuners would eliminate the need of additional HD-STBs for such features.

According to CableLabs, the two-way system uses the "Open Cable Applications Platform" (OCAP) as a middle-ware software specification (a common layer to communicate) for developers to make applications for interactive services that could run on any cable television system in the US, regardless of the HD-STB and Operating System.

OCAP 1.0, the first release issued in Jan 02, was based on a Java based engine. OCAP 2.0 release from CableLabs on May 02, adds Web technologies like HTML/XML.

Broadcast DTV Regulations Recently Approved

In November 2003, the FCC approved the "broadcast flag" anti-piracy order, to limit the indiscriminate redistribution of digital broadcast content. A digital code embedded into a digital broadcasting stream would signal DTV reception equipment to activate the redistribution limit.

The FCC allowed broadcasters to decide whether or not to include the flag with specific types of programming, and declined to prohibit the use of the flag with regard to certain types of programming, such as news or public affairs, although two of the five commissioners disagreed with the section that dealt with restricting also news programs, and content with expired copyrights, which would affect the sharing of such video clips over the Internet.

This regulation excludes digital devices that are not built with internal digital tuners, such as digital VCRs, DVD players, personal computers, etc. According to the FCC ruling, all existing

televisions, VCRs, DVD players will remain fully functional, even if they are incapable of reading the broadcast flag.

The new rules still allow consumers to make digital copies; the rules are only intended to prevent mass distribution over the Internet, and to encourage availability of "high value content" on broadcast television by discouraging its migration to more secure platforms such as cable and satellite TV service, according to the FCC.

The mandate will take effect in July 1, 2005. As stated before, the flag can also be applied to news and public affairs programming, at the discretion of broadcasters, an issue that consumers and free-speech advocacy groups had demanded not to restrict.

A demodulator (within equipment capable of tuning DTV) that complies with the flag mandate could still send the tuned signal to the analog component outputs of the device, but only to those digital outputs that meet with a copy-protection technology approved by the FCC (such as 5c).

The FCC still needs to go thru the process of approving those future copy-protection broadcast-flag technologies; there are three that are already pre-approved, including 5c. Companies that are part of the Broadcast Protection Discussion Group developed those technologies. Vendors of a particular content protection or recording technology need to be certified by the FCC in that such technology is an appropriate tool to give effect to the broadcast flag.

It is still unclear how the term "indiscriminate redistribution " of the copy protection order, oriented towards Internet distribution, would actually affect home networking. Equipment purchased before July 2005 escapes the ruling; that might set in motion a large number of purchases to occur before that date.

A recording (and compliant) DVD device would make a DVD recording that would not be playable on existing non-compliant DVD players, which could not decrypt the copy-protected signal, such as 5c. This could make an existing legacy DVD player limited from its original functionality, an issue that some groups indicate it could unfairly force consumers to buy new DVD players, although the FFC expressively states that " will not require consumers to purchase any new equipment".

It is still uncertain how multichannel video programming distributors (MVPDs), such as cable and satellite TV operators, who retransmit DTV broadcasts will be allowed/required to encrypt the digital content to maintain the flag, although the FCC gives them "the latitude to implement the flag as appropriate for their distribution platforms, whether it be through direct pass-through or by effectuating the flag's intent through their own conditional access system", as stated on the order, for which the FCC "is seeking further comment from MVPDs".

The FCC also stated "MVPDs may not assert greater redistribution control protection for digital broadcast content than that which the broadcaster has selected. In the case of content which a broadcaster has not marked with the flag, MVPDs must deliver that content to subscribers in a manner that reflects and gives effect to its unflagged status."

Some interesting comments made in the process of this ruling by the FCC are as follows: "…if first run DTV broadcast content were freely available over the Internet, then secondary, international and web cast markets could be threatened", "MPAA cautions that if current trends in compression efficiency, storage capacity and broadband speed persist, then in a few years it will take less time to download a high definition movie than to watch it", "Critics suggest that this

threat is overstated and that limits to existing broadband capacity will prevent widespread Internet retransmission of high definition digital content for the immediate future. One estimate indicates that it could take as much as four days to upload a one hour HDTV broadcast program to the Internet at standard consumer broadband speeds".

HD-STB vs. Integrated Tuners

Cost and Technical Considerations

Several manufacturers started to offer HDTV integrated versions with OTA/cable tuners on their 2003/4 lines. The integrated TV versions cost between $300-$1300 more than their monitor-only versions ($704 extra on average). The attached table and manufacturer specifications include a representative sample of lines and models.

The difference in price is justified by the cost of tuner/s and related components, such as an MPEG-2 decoder so the digital signal can be uncompressed for the TV to display, 1394 outputs so the tuned compressed digital signal can be sent out for HD-recording, etc.

HD-STB tuners are still costing between $400 and $900 MSRP. The retail value of tuners is expected to drop eventually.

Back in 1999, first generation rear projection HDTVs cost consumers between $5,000 and $10,000, most 42" plasmas started in the $12,000 range; it was expensive for early adopters. HD-STB tuners were selling between $400 and $900 (although there were some extreme cases on the $3000 range). At that time, the MSRP relationship between a RPTV and an HD-STB was approximately 10 to 1 on average.

Today, similar rear projection HDTVs cost consumers approximately $1,000/$3,000, and the 42" plasmas are now in the $4,000 range, and they are better products (better line-doublers, lenses, digital inputs, video processors and scalers, etc.). The price of a new HD-STB today has not changed much, although one can still find some 1999 STB technologies at discounted prices. Today, the MSRP relationship between a RPTV and an HD-STB is approximately 3 to 1 on average.

In other words, the price of a HD-STB tuner today, relative to the reduced price of today's DTVs, should be much lower than it is. The same should apply to the price of tuners within integrated TVs, as it can be read on the attached table.

Over the last 5 years, tuners within HD-STBs did not have a record as clean as one could expect the product to become a component of HDTVs, but they are certainly improving.

A tuner needing replacement or service might become a nuisance if integrated within a 300 pounds RPTV that most probably require and in-home service call/extra cost. Having the tuner as a separate HD-STB the problem could be solved as easily as just replacing/servicing just the STB; and if it would be a leased box the cable company should take care of the problem, which could facilitate upgrades to newer/better models. Leasing could be a good proposition during the period a technology needs to mature/evolve, like this one.

HD Tuning Capabilities

A cable-integrated HDTV owner that subscribes to premium cable services would be required to use a separate cable STB (unless the HDTV has an internal cable tuner with CableCARD, which are starting to come out on the last quarter of 2003). This subscriber would be paying for two tuners, one inside their new integrated HDTV for unscrambled services, and another into the external HD-STB for premium programming/interactive services (which also

performs unscrambled tuning). If you are required to use a STB for your particular cable services anyway, you might want to consider an HD monitor rather than an integrated set.

DBS satellite service subscribers of HD programming have already purchased a satellite HD-STB that should have an ATSC OTA HD tuner circuitry included; they should not need the OTA tuner integrated into a HDTV, nor they need a cable tuner.

An over-the-air antenna TV viewer should just need an ATSC tuner (assuming the viewer already has good DTV terrestrial reception). An integrated HDTV with an ATSC OTA tuner could be an option; a $400 over-the air STB connected to an HDTV monitor could be another option, if you are offered the option.

Current D-VHS VCRs only record in HD using the IEEE1394 (Firewire connection) input. A tuner, any tuner, should have a 1394 output to send the tuned signal to the digital VCR's 1394 input for recording. DirecTV decided that their STBs would not have that output, DishNetwork has been announcing that is coming with such feature soon (for two years already, and maybe the model 921 is out with the 1394 output enabled by the time you read this), some new OTA STBs have that output.

An integrated HDTV (having a built-in OTA/cable tuner) should also have that output (the RCA Scenium 2003 integrated line 140 was released with a 1394 connection but is only "in", not outputting the tuned HD signal).

One feature not (yet) included in 2003/4 integrated HDTVs is an integrated time-shifting recording ability as the one found on some new HD-STBs with PVR hard disc drives, although those are on the $1000 range (such as the Zenith HDR-230 recently released). One recording alternative for integrated HDTVs having two-way 1394 connections is a PVR-only (no tuner) unit, such as the new DVR10 from Thompson/RCA ($450); the TV's 1394-out is for the internal HD tuner to send the signal out for recording; the 1394-in is to playback from the PVR.

Backward Compatibility with NTSC Equipment

Many consumers would eventually need an economy-level digital STB to convert DTV signals down to NTSC so they can still watch the new digital broadcast using their old analog TVs; they might not be able to afford retiring analog TVs that might still be in perfect conditions.

Many would have several analog tuners (TV, VCR, Tivo, etc.) on the house, and would then require several "low cost" down-conversion STBs. In order for that to happen, the price of STBs needs to be reduced considerably. New OTA STB models can down-convert but are still in the range of $400.

People should be able to continue using their non-HD TVs for as long as their budget dictates, regardless of the DTV implementation schedule. With the cable agreement and OTA tuner mandate it is to be expected that a large mass of HD tuners would be produced, hopefully that would bring prices down as needed.

Upgrade Capabilities of Cable Tuner/s (and Integrated HDTVs)

Inform yourself to been able to anticipate how the future cable bi-directional features (that are still in the works by the industry) would eventually be applied to the integrated set you

might want to buy in the 2003/4 period (with only unidirectional features, or with no CableCARD at all).

In other words, when an agreement is reached about how to implement the bi-directional features, possibly next year, one would hope that it would protect the consumer that helped the implementation of the OTA mandate and Cable agreement with his/her early-integrated purchase.

Otherwise, to been able to have the VOD, impulse PPV, and cable guide features of the bi-directional system, the cable subscriber might be facing a) the early replacement of the cable-integrated TV or HD-STB, or b) the addition of a bi-directional cable HD-STB (read as: pay for another tuner).

One Mitsubishi dealer indicated that Mitsubishi was committed to make their HDTVs future proof, and that included cable tuners. It is not clear what exactly that would mean, but reference was made to what Mitsubishi did with their "Promise Module" which provided earlier generation sets with 1394 digital connectivity and HD tuning capabilities. Their 2004 cable-integrated lines are not CableCARD suited.

According to the specific (underlined) wording of the "Promise", it seems that an upgrade path to CableCARD unidirectional or bi-directional might not actually be on their plans: *"We will engineer and manufacture the upgrades necessary so the television you purchase today can be made compatible with near-future advances in digital television and digital interconnectivity. Specifically, we promise that you will be able to have your television upgraded, at a reasonable cost, to include an off-air HDTV tuner, a cable TV tuner (for unscrambled programming)… (Underline added)",*

However, while Mitsubishi might not satisfy all of the consumer-upgrade dreams to perfection, it is certainly a company that at least offers some comfort by announcing their upgrade plans in written and executing them the best they can for their customers. Most manufacturers of integrated sets/cable tuners are not committed to any future upgrade plan (we have seen this with DVI digital connectivity before).

Analysis Summary

For your convenience, the following table shows a comparison of integrated TVs vs. monitors of 2003/4. Quoted prices are MSRP when the product was/will be introduced to the market. Quoted price differences are based on MSRP. Some HDTV sets introduced early in 2003 might now be publicly listed at reduced MSRPs (or further reduced as sale items on the street); although in some cases that situation is highlighted, this report does not intend to do that consistently.

When comparing the differences of a given line/manufacturer with the current price of a separate HD-STB (as an alternative to integration), take into consideration that some new integrated TVs incorporate two tuners at once, OTA and cable, a feature that usually is not available in a separate cable-HD-STB (DirecTV and DishNetwork satellite STBs include OTA tuners). Some integrated TVs have only one RF input for DTV reception even when having two internal tuners, in such case a choice would need to made between OTA and Cable services for the use of the plug-and-play connection. Such limitation does not exist on satellite HD-STBs.

Cable ready sets suited with integrated basic cable tuners for unscrambled non-premium service, or with unidirectional CableCARD/POD tuners, might eventually disappoint uninformed buyers if bi-directional features could not be incorporated transparently to their sets.

Consumers that dislike STBs sitting on top of their TV monitors should find integration very appealing. Connectivity will be simpler for them.

Consumers that do not mind STBs might want to investigate lease options that might be offered by the cable company and rent a box until bi-directional features are implemented. Later, they might want to purchase a cable HD-STB or an integrated set with matured software, hardware, and bi-directional CableCARD features.

The ideas expressed above should not be interpreted as against integration but rather as a revelation for 2003/4 potential buyers, since tuner prices might not come down significantly until after that period. Those buyers might also be misled at stores untrained with the plug-and-play appearance, believing that their new cable-integrated HDTV covers all the known cable-features.

Our industry leaders showed optimism about integration. Let us all hope the best by sharing their optimism, and by looking at the bright side of the agreements and mandates. After all, without any agreements, the progress of HDTV could become much more difficult, slow and expensive for everyone, more expensive than a duplicated integrated tuner.

Comparison Table of Monitors and Integrated HDTVs

(Data compiled Oct 03)

Manufacturer	Models/Lines	Size	Original MSRP $ Difference	Main Feature Difference
Hitachi	2003 SWX Monitor vs. XWX Integrated lines	51"/57"/ 65"	$1300	ATSC tuner w/1394
	2004 S500 Monitor vs. S700 Integrated lines	65" & 57"	$400	ATSC/QAM unscrambled
	2004 S500 Monitor vs. T750 Integrated lines	65" & 57"	$700	ATSC/QAM w/CableCARD
JVC	2003 84 Monitor vs. 94 Integrated lines	56"	$400	ATSC tuner with 1394
		65"	$300	ATSC tuner with 1394
Mitsubishi	2003 current models	48"	$1100	ATSC/QAM unscrambled
		55" & 65"	$900	ATSC/QAM unscrambled
	2004 models (4Q03, 1Q04)	48" & 65"	$800	ATSC/QAM unscrambled
		55"	$900	ATSC/QAM unscrambled
Panasonic	Integrated line for 4Q03 vs. WX 2003 Monitor line	47" & 56"	$700	ATSC/QAM w/CableCARD, DVI (monitors) vs. HDMI (integrated)
		53"	$800	Same
Samsung	DLP line	61"	$500	ATSC/QAM unscrambled, without 1394 (unavailable)
Sony	2003 line	3 models	$700	ATSC tuner
Thomson/RCA	2003 Scenium line	52" & 61"	$700	ATSC tuner, 1394 "in only"
	New models announced June 03, Scenium line	52"	$700	ATSC/QAM unscrambled
		56"	$600	ATSC/QAM unscrambled
		61"	$400	ATSC/QAM unscrambled
	New models announced June 03, RCA line	52"	$700	ATSC/QAM unscrambled
		56"	$600	ATSC/QAM unscrambled
Toshiba	Theater Wide and Cinema Series current RPTVs	3 models	$600	ATSC/QAM unscrambled
Zenith/LG	New Plasma for Oct//Nov 03, Monitor vs. OTA Integrated	50"	$1000	ATSC tuner (1394 info N/A)

Note: this table above and the following list are not intended to include all the manufacturers and lines. Prices are MSRP at product release time.

DTVs and HDTVs

CRT, LCoS, D-ILA, and LCD – Panels, FPTVs (front), and RPTVs (rear) projection TVs

Note: The following is a representative list of relatively new and future models; hundreds of other models that are still current could be found in the CES 2003 report, and are not mentioned on this list. The union of both reports could provide a broader idea of most manufacturers and models available.

BenQ

New LCD panels

26" DV-2680 $3,000
30" DV-3080 $5,000 also available in Feb/Mar 04
46" DV-4680 $8,000, TTM Aug 04, 1920x1080p, NTSC/PAL/SECAM/ATSC, 600 ANSI lumens, 800:1 CR, component, RGB VGA D-sub, DVI/HDCP

Cannon

New LCD FPTVs (multimedia projectors)

LV-7555 $8,000, TTM current, 1024x768, 4600:1 ANSI, 900:1 CR, DVI-D/HDCP, VGA, component in
LV-7215 $3,000, TTM current, 1024x768, 2500 ANSI, 350:1 CR, 35 dB fan noise, component in, DVI-I/HDCP, VGA

Epson

New LCD RPTVs

Living Station monitors

TTM Feb 04, 3 LCD chips, photo printer, multi-format flash memory card slots (memory stick, SD/MMC, Smart Media, Compact Flash, XD cards via included adapter) to display JPEG images on the video screen, external CD-R drive to playback CD images, 1280x720, DVI/HDCP, VGA for PC, RGB, 2 component in, 4x6 dye-sublimation photo printer (paper offered at $15 for 50-pack), 100 watt lamp life 10000 hrs, 800:1 CR, horizontal viewing point 130 degrees (48 vertical)
47" LS-47P1 $3,700
57" LS-57P1 $4,000

Comments on CES demo: demo showed OK with the typical black level weakness of current LCD technology, whites were not as bright, objects with different black tones did not show as detailed as other technology would, practical setup for people largely involved with photo features

New LCD FPTVs

Powerlite line

Powerlite Home 10 $1,300, EDTV, TTM Current, 854x480 for 16x9 480p video, 3 LCD chips 0.55-inch, AR control, 700:1 CR, supports 1080i and 720p, digital keystone adjustment +- 15 degrees

Cinema 200 $3,000, 1280x720, 1300 ANSI lumens, 800:1 CR, comp, VGA,
Cinema 500 $5,000, 1280x720, DCDi, HDMI, 3000 hrs lamp (1700 dynamic), 1200:1 CR, 1000 ANSI, 27dB to 35 dB fan noise, 2 x RGBHV component, USB, Ethernet, RS-232

(Announced CEDIA Sep 03)
Powerlite 7800p $4,500, 3500 ANSI lumens, 1024x768, 700:1 CR
Powerlite 8300i $11,500, 5200 ANSI lumens, 1024x768, 1200:1 CR

Hitachi

New Models announced on Jun 03

VirtualHD 1080p Digital Video Processor (all incoming 1080i/720p/540p/480i signal sources are internally unconverted to 1080 progressive, before scaling then to the native resolutions of the displays), 1080i or 540p user-selectable display format.

New automatic 3:2 film correction, new 26-point advanced video processing, six new aspect modes plus HD zoom, new pure digital color management, and advanced HD Digital Window(TM) split screen. Exclusive Super Contrast CRTs and Exclusive 5-element Super Contrast Lens featured in the T750, S700, and S500 series.

New High-performance Multi-Element Screen, DVI-HDTV Input. Day and Night Memory By Input (new UltraVision series remembers picture settings by input). Digital Photo Display. Memory cards supported include Compact Flash(R), Smart Media(TM), Memory Stick(R), SD "Secure Digital(TM)," MMC "Multimedia card(TM)" and IBM Microdrive(TM). Four-color temperature memory, High-contrast 0.52mm fine-pitch screen.

T750 Integrated RPTV Series

TTM 4Q03, integrated ATSC/QAM cable w/POD tuners (unidirectional), Learning AV NET, two-piece cabinet design, auto digital convergence with timer and 117-point manual digital convergence, two IEEE 1394/5C interface input/outputs and a DVI-HDTV digital video, Simple Remote, anti-reflective high-contrast shield and first surface mirror, come equipped with a universal memory card slot

57”	57T750	$4,000
65”	65T750	$4,500

S700 Integrated RPTV Series (w/o CableCard)

TTM 3Q03, include two IEEE 1394/5C, come equipped with a universal memory card slot, integrated ATSC/QAM unscrambled cable tuners (lacking the CableCARD slot for scrambled channels). Anti-reflective high-contrast shield and first surface mirror, two IEEE 1394/5C interface input/outputs, DVI-HDCP, two wideband component video inputs, optical digital audio output, universal memory card slot input for digital photo display, auto digital convergence with timer and 117-point manual digital convergence

51”	51S700	$3,400
57”	57S700	$3,700
65”	65S700	$4,200

S500 Monitor RPTV series

TTM 3Q03, requires an optional PCMCIA bridge, DVI-HDTV, 2 wideband component video inputs

51”	51S500	$3,000 ($2,500 street $)
57”	57S500	$3,300, two-piece cabinet
65”	65S500	$3,800, two-piece cabinet

According to TWICE (June 23, 2003), the POD capability adds roughly $700 premium over similarly featured integrated sets that omit cable plug-and-play compatibility.

T500 Tabletop Monitors
57″ 57T500 $3,500
65″ 65T500 $4,000

W500 Tabletop Monitor
46″ 46W500 $2,400, TTM 3Q03 ($1,800 street $ Sep03), built-in DVD player, DVI-HDTV input, two wideband component video

F500 Monitor RPTV Series
TTM current (Sep 03), optional stand, 4-element lens system, DVI-HDTV input, two wideband component video inputs
46″ 46F500 $2,100
51″ 51F500 $2,500
57″ 57F500 $3,000 ($2,200 street $ Sep 03)

G500 Monitor RPTV series
DVI
51″ 51G500
57″ 57G500

F300 4x3 RPTVs Series
TTM 3Q03, three color temperature settings, two wideband component video inputs
43″ 43F300 $1,800, 4 element lens, optional stand
53″ 53F300 $2,100, 5 element lens

CRT RPTV Integrated
ATSC tuner, QAM tuner w/CableCARD unidirectional, DVI/HDCP, 1394, TTM 4Q03
57″ 57X750 $4,800
65″ 65X750 $5,300 (also seen as 4,500)

LCD RPTV monitors
Three chip LCD, virtual 1080p processing, 3:2 pull-down, DVI/HDCP, gloss silver cabinets, TTM 4Q03
50″ 50VX500 $4,500
60″ 60VX500 $5,300

LCD RPTVs
1366x768 three LCD panels, PC card slot for digital photo viewing, AV NET, VirtualHD 1080p processing.
50″ 50V500 $3,800
60″ 60V500 $4,500

CRT RPTVs
X500 line monitors
Two piece cabinet, DVI
57″ 57X500 $4,300, TTM Sep 03
65″ 65X500 $4,800

LCD FPTVs
(Announced CEDIA Oct 03)
CP-S210W 6 lbs, 800x600, 1200 lumens
CP-X870W 2000-lumens XGA-resolution light box, lamp life of 4000 hours.

Infocus

LCD FPTV (meeting room projector non-HD quality)

LP640 $4,000, TTM current, 1024x768, 3 x 0.79" LCD chips, USB, RS-232, 2200 ANSI, 400:1 CR, +- 15% horiz keystone correction, +-25% vertical, 2000 hrs lamp, 34dB fan noise, 4:3 native aspect ratio, no component, no DVI

JVC

(Announced Oct 03)

Professional line FPTV

DLA-HX1U $12,000, 1400x768, 16x9 native, 3 chip, TTM Dec 03, accepts 720p/1080i/1080p inputs, DVI/HDCP, manual focus, manual zoom, 1000 ANSI lumens, 800:1 CR, 250-watt NSH lamp, proprietary Digital Image Scaling Technology D.I.S.T

(Announced at CEDIA Sep 03)

D-ILA FPTV

Shown at CEDIA in a private room, 1080p native, ships sometime 1Q04

Commercial RPTV

60" Z795 $N/A, 0.7 inch 720p chip

2003 current models CRT RPTVs:

74 line Monitors

DVI, D.I.S.T at 1080i, HD DSD, 6500K color temperature, switchable 3:2 pull-down, auto-convergence, selectable scan velocity modulation, white character correction circuitry

48" AV-48WP74 $1,700, TTM April 03, (also listed as $1,900 MSRP on July 03)
56" AV-56WP74 $2,200, TTM April 03, ($1,800 street $ on Sep03)
65" AV-65WP74 $2,900, TTM Mar 03

84 new line Monitors

TTM Aug 03, D.I.S.T 1500i, new 16M 10 bit 3D/Y digital comb filter, selectable SVM, new emissive light universal remote, new HD range 75 MHz digital super detail, DVI/HDCP

56" AV-56WP84 $2,700
65" AV-65WP84 $3,200

94 new line Integrated

Upgrade of 84 line, TTM Sep 03, with ATSC tuner and two-way 1394

56" AV-56WP94 $3,100
65" AV-65WP94 $3,500

(Announced at CES 2004)

New CRT RPTV models to replace the 74, 84, and 94 lines above

Monitors TTM Apr 04

48" AV48P575 $1,700
56" AV56P575 $1,900

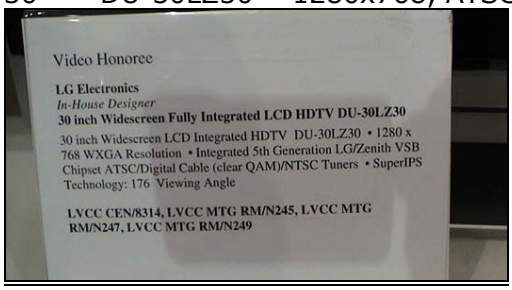
Integrated TTM Aug 04

48" AV48P775 $2,200
56" AV56P775 $2,400

(Announced at CES 2004)
New D-ILA RPTV Monitors
1280x720, 0.7 inch D-ILA 3-chip design, DIST technology, HDMI, 2 component
52" HD-52Z575 $4,500, TTM Jul 04
61" HD-61Z575 $5,500, TTM Jul 04
New D-ILA RPTV Integrated Models
Same as above plus ATSC and QAM unidirectional tuners w/CableCARD, 1394, integrated models will be $500 more than the monitor versions
52" HD-52Z795 $5,000, TTM 3Q04
61" HD-61Z795 $6,000, TTM 3Q04

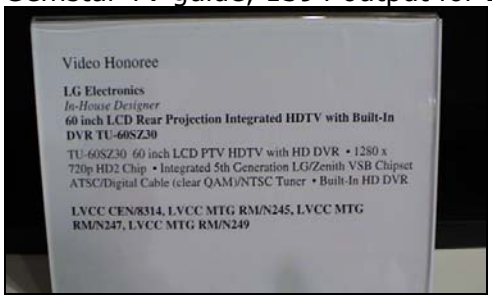
Key Digital
(Announced Sep 03)
New HD Leeza scaler
KD-HD1080p $4,000, TTM July 03, two DVI/HDCP, outputs 640x480, 720x480, 852x480, 1024x512, 800x600, 960x540, 1920x540, 852x576, 1280x720, 1024x768, 1280x768, 1365(6)x768, 1280x960, 1024x1024, 1280x1024, 1365x1024, 1400x1050, and 1920x1080, RS-232 port

LG
(Announced at CES 2004)
New LCD panels integrated
30" DU-30LZ30 1280x768, ATSC/QAM on-the-clear/NTSC tuners

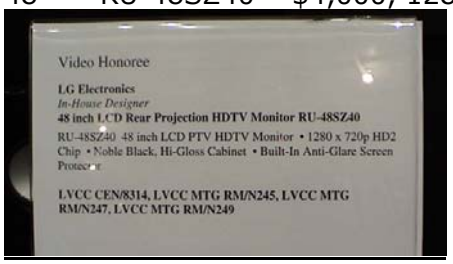


37" TTM Sep 04
42" TTM Jun 04
52" TTM Oct 04 (data could not be confirmed)
55" DU-55LZ30 $15,000, TTM Jan 04, 1080px1920, integrated w/ATSC tuner, 500 cd/m2, view angle 176x176 degrees, HDMI

New LCD RPTV Integrated
60" TU-60SZ30 $TBA, TTM Jun 04, 1280x720, ATSC/QAM tuners, built-in 120GB DVR, Gemstar TV guide, 1394 output for D-VHS, DVI/HDCP, (HD2 chip spec text on picture is an error)



48” RU-48SZ40 $4,000, 1280x720 LCD, TTM Mar 04 (HD2 spec text on picture is an error)



FPTV
RL-JA20 $TBA, TTM 1H04, DVI, component, RGB, DCDi

Madrigal
D-ILA FPTV
MP-D1 $26,000, 1365x1024, RGB, component
CRT FPTV
MP-9 $60,000, 480p, 540p, 720p, 960p, 1080i/p, RGB via BNC

Maxx
Video processors
(For the 1400LCoS panel), DVI/HDCP input
Maxx AVP 100 $2,000
Maxx AVP 200 $2,500

LCD FPTV
(Announced Sep 03)
Maxx 3000 $4,500, 1280x768, NTSC tuner, 500:1 CR, RGBHV (15 D-sub), DVI, component

Mitsubishi

Mitsubishi has ended its moratorium on the use of Digital Visual Interface (DVI-HDCP) inputs, and is including them on most models in the 2003-04 lines. Mitsubishi also announced a second generation to its Promise Module as a STB to connect to Mitsubishi’s and other vendor monitors (see HD-STB Section).

2003-2004 Products (Announced April 03)

LCoS integrated RPTV

82” Alpha82 WL-82913 $21,000, TTM fall 03, 1920x1080 pixel display and input capability, ATSC/QAM tuner, accept full 1080p signal, upconverts all inputs to 1080p, 1 DVI, two 1394 in rear (one in front), RS-232 control, 15 pin D-sub VGA for up to 1080p input, 2 component inputs, 1 auto-select HD component input and RGBHV

Two new series of RPTV CRT monitors
Featuring: MonitorLink connection (DVI/HDCP and RS-232) to connect to new HD-5000 STB for like integrated capabilities, "PerfectColor System," which enables independent control of six colors, and Advanced Multimedia Video Processing, which reduces artifacts in up converted images, 3:2 pulldown, 64 point convergence, Diamond Shield removable (by user on 48"/55"/65" models, and by a service call on the 42").

Silver
42" WT-42313 $1,800 ($1,600 street $ Sep 03, $1,500 Dec 03), MicroFine CRTs
48" WS-48313 $2,200 (1,800 street $ Sep 03), MicroFine 3 CRT Improved focus
55" WS-55313 $2,600 ($2,100 street $ Sep 03, $2,000 Dec 03) 3 comp, MicroFine 3 CRT Improved focus
65" WS-65313 $3,200 ($2,800 street Aug 03, $2,600 Sep 03), MicroFine 3 CRT Improved focus

Silver Plus
Added feature to above line: QuadField Focus (except 42"), Net command IR and code learning (except 42")
42" WT-42413 $2,100 ($2,000 to $1,700 on street $ Sep/Dec 03)
48" WS-48413 $2,400 ($2,000 to $1,800 on street $ Sep/Dec 03)
55" WS-55413 $2,800 ($2,600 to $2,100 on street $ Sep/Dec 03), EDF lenses
65" WS-65413 $3,400 ($3,200 to $2,600 on street $ Sep/Dec 03), EDF lenses

Four New Series of RPTV CRT fully integrated sets
ATSC, QAM for unscrambled
NetCommand 3.0 on-screen home-theater control system with IR remote code learning capability and MonitorLink/DVI-HDCP input. AMVP video processor for pixel multiplication, 5-format memory card readers for MP3, WMA music and JPEG photo files, PerfectColor Precision 6-way, MicroFine Improved focus, two 1394 rear (one 1394 front), Color Tuned Diamond Shield, 3:2 pulldown, 64 point convergence.

Gold
Was not available on street by Sep 03
No Quad Field Focus, all $ MSRP at press release
48" WS-48513 $3,000
55" WS-55513 $3,300 ($2,800 street $ after Sep 03)
65" WS-65513 $3,800
73" WS-73513 $6,300, 9" CRTs

Gold Plus
Added features to above line: QuadField Focus, EDF lenses, TTM Oct 03
48" WS-48613 $3,000 (press release $3,300, $2,700 street $)
55" WS-55613 $3,300 (press release $3,600, $3,000 street $), two coax speakers
65" WS-65613 $3,800 (press release $4,100, $3,500 street $), two coax speakers

Platinum
TTM 4Q03 (was unavailable on Oct 03)

Added features to above: Tru-Focus lenses, improved two-way speakers, enhanced cosmetics and gold connectors.

65" WS-65713 $4,800
73" WS-73713 $7,300, 9" CRTs

Diamond
Added features to above: Fine-pitch lenticular screens, and anti-glare DiamondShield screens
55" WS-55813 $4,500 ($5,000 press release, $4,000 street $ Dec 03)
65" WS-65813 $5,500 ($6,000 press release, $5,000 street $ Dec 03), 9" CRTs

Mitsubishi may continue to offer 4:3 HDTV upgradeable monitors for dealers who request them this year, but has elected to push only 16:9 widescreen models this year. The company re-introduced a small assortment of 4:3 models last year at the request of dealers.

LCD panel
(Announced at CEDIA Sep 03)
40" LCD4000 TFT LCD monitor, 1280x728

LCD FPTV
(Announced at CEDIA Sep 03)
XL5950 Color View 1024x768, 4700 lumens

NEC
(Announced at CEDIA Sep 03)
LCD panels
DT20 1024x768 LCD panels, copies document to screen**,** shows 3D objects from its scanner, 2800 lumens
VT6000 and T6000R 1400x1050 LCD panels (SXGA+), 9000 hour lamp life, two lamps for 5300 or 2700 lumens (GT9000) and 2000 or 1000 lumens (GT9000R)

Panasonic
The following models included on the CES 2003 report are still included here because their release was postponed and were recently released in the 4Q03, all the new models announced at CES 2004 are included at the end of the Panasonic grouping:

Integrated CRT RPTV New Model announced at CES 2003
56" PT-56TWD63 $2,700

ATSC/QAM cable tuners, 1394, component in, HDMI/HDCP, unidirectional CableCARD for cable (by Scientific Atlanta), and part of the Host Interface License Agreement (PHILA) plan.

Other new Integrated 2003 RPTV Models announced at CES 2003
Fully integrated CRTs w/ATSC, 2 NTSC tuners, QAM w/cable CARD unidirectional, TTM Oct 03, HDMI/HDCP
53" PT-53TWD63 $2,500, TTM Nov 03
47" PT-47WXD63 $2,100
53" PT-53WXD63 $2,300

Similar as the TWD model above, but with 30watts audio rather than 60watts as the TWD, and excludes anti-reflective screen-shield, no D73 lens system, no HD3D sound, 4 speakers rather than 6, 2 inches shorter, 7 inches slimmer, same depth, 36 pounds lighter.

At CES 2003 Panasonic stated that they would not increase the price of the TV sets when incorporating the QAM cable tuner (although there was an actual increase of $600 for the integrated version). They also stated that there are no plans to return to 720p on CRT RPTVs in the future.

2003 RPTV CRT Monitors
WX - Line
DVI/HDCP, TTM May 03, 480p/1080i, component, 7" CRTs, 4 speakers, 30W amp, 850 lines resolution, regular screen shield, .52 mm lenticular screen, 2 component in, 3:2 pull-down
47" PT-47WX53 $1,500
53" PT-53WX53 $1,700
56" PT-56WX53 $2,000

TW- Line
Same features of the WX line plus VIVA sound, anti-reflective shield, 6 speakers, 60-watt amp
53" PT-53TW53 $2,000
56" PT-56TW53 $2,200

LCD FPTV 2003 New Models
PT-AE200U $2,000, 854x454, 700 ANSI lumens, 700:1 CR, vertical keystone correction, PC D-sub 1 pin, 3 component, NO DVI, TTM May 03
PT-AE500 $2,500, TTM Dec 03, 1280x720, 850 ANSI, 1300:1 CR, DVI/HDCP, component, 27dB fan

2003 LCD RPTV models
43" PT-43LC13 $3,000, TTM Jun 03
50" PT-50LC13 $3,700, (3,000 street $ Aug/Dec 03) TTM Jul 03, HDMI/HDCP, 1394/DTCP, component, table top (stand 5303174), 1280x720

LCD RPTV cable ready integrated TVs
(Announced Aug 03)
ATSC/QAM CableCARD (unidirectional) tuners, TTM Dec 03, HDMI, 720p, all formats converted to 720p, HDMI, 2 RGB D-sub 15, 3 component ins
50" PT-50LCX63 $4,000 ($3,800 street Sep 03)
60" PT-60LCX63 $5,000 ($4,600 street Sep 03)

RPTV Monitor
(Announced Sep 03)
60" DT-60LC13 $4,000, TTM Oct 03, 1280x720 three chip, dual NTSC tuners, three HD component.

In 2003, Panasonic stated that they have plans to offer digital cable ready fully integrated HDTV sets in direct-view, LCD and Plasma models early in 2004.

Other LCD panels
(Announced at CEDIA Sep 03)
PT-LC80U 4.6 pound, 1024x768, 2000 lumens, anti-theft features (panel lock-out), text superimposition over any image (important for the education market)
PT-L735NTU 1024x768, 2600 lumens, networking features, 10 lbs
PT-L735U same as above except no networking, 10 lbs

(All the following models were announced at CES 2004)
Six LCD based RPTVS

Of which:
Integrated
w/ATSC/ QAM CableCARD tuners, HDMI
47" PT-47XD64 $2,000, TTM Aug 04
53" PT-53XD64 $2,200, TTM Aug 04
53" PT-53TWD64 $2,400, TTM Sep 04
Monitor
53" PT-53X54 $1,700, TTM Mar 04

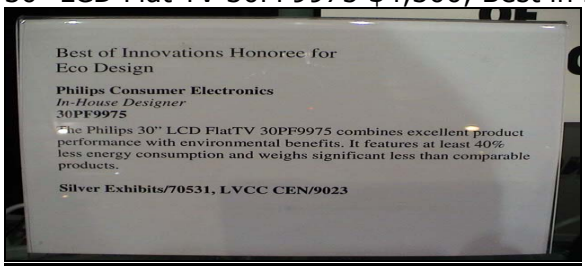
2004 New LCD RPTV models replacing the PT-LC13 line mentioned above
43" PT-43L14 $2,700, TTM Jun 04
50" PT-50L14 $3,000, TTM Jun 04

2004 Integrated LCD RPTVs to replace the PT-LCX63 pair just released in 4Q03
50" PT-50LCX64 $3,500, TTM Sep 04
60" PT-60LCX64 $N/A, TTM N/A (demo unit too rich in contrast)

2004 RPTV Monitor to replace the DT-LC13 just released Oct 04
60" DT-60LC14 $4,000, TTM Jun 04

Philips
RPTVs
7" CRTs, 1080i/480p, DVI, component, TTM current
55" 55PW9383 $2,300
55" 55PW9363 $2,100
60" 60PW9383 $2,600
60" 60PW9363 $2,300

LCD TV
30" LCD Flat TV 30PF9975 $4,300, Best in Innovations CES 2004 for Eco-Design



Pioneer
Several sources indicated that Pioneer is planning to abandon the CRT business to concentrate in plasma. There were no CRT RPTVs displayed at CES this year.

2003/4 CRT RPTV Elite Monitors
(Announced Oct 03)
TTM winter 2003/4, HDMI/HDCP, ISF calibration mode submenus (Pioneer is now an ISF partner)
53" PRO-530HDi $5,000 (street as low as $3,000 after rebates Oct 03)
64" PRO-730HDi $7,000 (street as low as $4,500 after rebates Oct 03)

Proton
LCD integrated
40" LM-40W $5,000, TTM current, ATSC/NTSC tuners

Samsung
2003/4 models LCD TV Integrated (claimed by Samsung as the world's largest at CES 2003)
46" LTN468W $11,000, TTM 4Q03 or early 04 (begin production 1H03), TFT 1080px1920, DVI/HDCP, DNIe, 170 degree viewing angle in all directions (PVA), 600:1 CR, 500 cd/m2 brightness, ATSC/QAM cable tuners

LCDs flat screens announced during 2003
(Announced June 03 and on CEDIA Sep 03)
DVI/HDCP, DNIe, 1280x768
40" LTN406W $9,000, TTM July 03, integrated NTSC tuner
(Announced in Apr and later again in Oct 03)
54" LTN545W $30,000 (estimate), TTM 2H04 (originally late 03, early 04), 1080px1920, 2 inches thick, 44 pounds, SRS TruSurround

40" SyncMaster 403T 1280x768 TFT LCD multimedia monitor
40" LS40A1 1280x768 TFT LCD, 600:1 CR, 500 cd/m2, DVI

RPTVs CRT New models
DVI/HDCP, NO 1394, 3:2 pull-down, 480i (no line-doubling), 480p native, 720p, 1080i, stretch and scroll modes
42" HCN4226W $1,500 street Sep 03, TTM Apr 03, 2 comp in
47" HCN4727W $1,500, 3 comp in
55" HCN5527W $2,100, ($1900 Oct 03), TTM May 03, 2 comp in
65" HCN653W $2,700, TTM May 03, 3 comp in, ($2,500 street $ Aug 03, $2,400 Sep 03)
New Integrated CRT RPTV models, Tantus line
Dual NTSC tuners, ATSC tuner, DVI/HDCP
55" HCN-5529W $2,500, TTM May 03
55" HCN559W $2,600
52" HCN529W $2,300, TTM April 03, no 1394 out

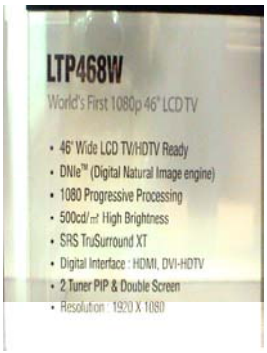
(All the following models were announced at CES 2004)
CRT Monitor RPTVs
Samsung announced that it would drop the 55" and 65" sets to focus on micro-display technologies)

TTM Apr 04, HDMI/HDCP, 2 component
42" HCP4252W $1,200, table-top
43" HCP4356W $N/A, DNIe
47" HCP4752W $1,300
52" HCP5252W $1,500

Later in Spring 2004 Samsung will release another model, integrated with ATSC tuner (no Cable):
52" HCP5256W $2,200, TTM May 04, integrated w/ATSC/QAM CableCARD, DNIe, HDMI

LCD TV Monitors

46” LTP468W $20,000, TTM Jun 04, 1920x1080, 500 cd/m2 brightness, 600:1 CR, HDMI/HDCP, DNIe



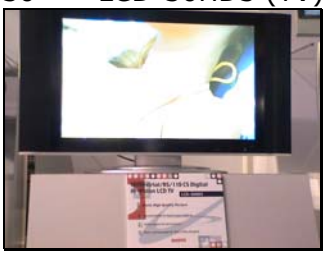
57” LTP578W $TBA, TTM Jun 04, 1920x1080, 1000:1 CR, 600 cd/m2, DNIe, HDMI, DVI

CRT direct-view

Samsung will drop curved faced tubes and use flat-faced CRTs by April 04. Later Samsung will introduce integrated sets with ATSC tuners (no QAM Cable) for approximately $100 extra cost over the monitor versions.

Sanyo

30” LCD-30HD3 (TV)



LCD FPTV

PLV-Z1 800:1 CR, 700 ANSI lumens

PLV-Z2 $2,500, TTM Feb 04, 1280x720, 3 LCD 0.7 chips, 1300:1 CR, 800 ANSI lumens, DVI-I/HDCP, component, +- 20% keystone correction, 24 dB fan noise, demo looked washed

Sharp

AQUOS GD4U Series LCD panels integrated

45" LC-45GD4U $TBA, TMM 2Q04, 1920x1080p, PC card slot, 1 bit digital audio amps, HDMI/HDCP, DVI/HDCP, ATSC/QAM unidirectional, 450 candelas, 800:1 CR, 60,000 hrs lamp life

New Controller

TU-GD1U ATSC/QAM CableCARD tuners, TTM 2Q04, $TBA, 2 component, HDMI and DVI

Sony

(Announced Mar 03)

Fully integrated RPTVs

ATSC tuner, TTM Sep 03, DVI/HDCP, Enhanced memory stick slots, 3 i.Link 1394 connections

51"	KDP-51WS550	$2,500 (price drop from $2,700 Sep 03)
57"	KDP-57WS550	$2,900 (price drop from $3,000 Sep 03)
65'	KDP-65WS550	$3,300 (price drop from $3,500 Sep 03)

LCD based Grand WEGA RPTVs

TTM Sep 03, DVI/HDCP, enhanced Memory stick for JPEG playback, DDC (Direct Digital Circuitry) to reduce number of A/D and D/A conversions, DRC (Digital Reality Creation) scaler, and MIDX (Multi-Image Driver X) for side-by-side PIP with analog and digital sources, 720P>1080i

42"	KF-42WE610	$2,800
50"	KF-50WE610	$3,300
60"	KF-60WE610	$4,000

70" also will be produced

New CRTs based Hi-Scan RPTVs Monitors

DVI/HDCP, TTM July 03, 720p>1080i

46"	KP-46WT510	$1,700 ($1,600 Sep 03), tabletop
51"	KP-51WS510	$1,800 (price drop from 2,000 Sep 03)
57"	KP-57WS510	$2,200, 480i > 960i using DRC, 480p and 1080i bypass DRC
65"	KP-65WS510	$2,600

New Direct view CRTs

DVI/HDCP, memory stick, 720p>1080i

KV-34HS510	$2,000 TTM Aug 03
KV-34XBR910	$2,800 TTM July 03

New Sony Projection technologies

SXRD FPTV QUALIA 004 $25,000 (Silicon Crystal Reflective technology)

Fixed pixel micro-device), image more film like, manufacturing more efficient and capable than LCoS, LCD and DLP, TTM end of 2003, for both RPTV and FPTV, 3 chip 1920x1080p, .78 " diagonal panel with pixel pitch of 9 micrometers each. Fill factor almost 92 percent. Pixel density increased almost 2.5 times over current micro display technology, 10-fold improvement in pixel spacing compared with typical LCD or single panel DLP products. Cell gap size less than 2 micrometers. 3000:1 CR, 1000 ANSI lumens, final products might be higher. The technology might be targeted as a step-up display to current LCD projection models, xenon lamp developed for this projector, Carl Zeiss glass optics, Cinema Black PRO circuitry to adjust black levels via lamp wattage and iris control.

GLV (grating light value laser projection) technology showed by Sony in the past is probably still a few years from market, maybe for commercial movie theater projection systems.

According to Sony's statement in 2003, by 2005 the CRT based tech will continue to dominate the industry with unit sales still 85% of the total, non-CRT products will be 40% of all $ sales.

Grand-WEGA XBR LCD Integrated RPTVs
ATSC tuner, iLink/DTCP, DVI/HDCP, QAM tuner without CableCARD

60"	KDF-60XBR950	$5,500, TTM fall 03
70"	KDF-70XBR950	$7,000, TTM Dec 03, 3x0.87"wide XGA LCD panels

New Cineza FPTVs LCD projectors
(Announced Sep 03)
TTM Oct 03, HDMI/HDCP, improved contrast and brightness over last year's models

VPL-HS3	$1,500, 800:1 CR, 858x484
VPL-HS20	$3,500, 1,300:1 CR, 1386x788

SuperLite LCD projectors
(Announced CEDIA Sep 03)
5 pounds

VPL-CS6	800x600, 1800 lumens
VPL-CX6	1024x768, 1500 lumens)
VPL-PX35	Network projector, 1024x768, 2600 lumens
VPL-FX51	upgrade to the VPL-FX50, 1024x768, 3500 lumens
PJNet	Network projector management software (about $500)

Thomson/RCA
(Announced Jun 03)
Scenium Integrated RPTVs
ATSC/QAM unscrambled cable tuners, Net-Connect Ethernet web browsers, HiPix picture system, DVI/HDCP, 2 1394/DTCP 2 way interfaces

52"	HD52W151	$2,800
56"	HD56W151	$3,100
61"	HD61W151	$3,300

RCA line Integrated RPTVs
ATSC/QAM unscrambled cable tuners, tru-Scan Digital Reality signal processing, two way 1394/DTCP inputs, and DVI/HDCP input, TTM July 03

52"	HD52W41	$2,500
56"	HD56W41	$2,800

Scenium Monitors
DVI/HDCP (w/DVD player)

52"	D52W136D	$2,100, TTM June 03
56"	D56W136D	$2,500, TTM July 03
61"	D61W136D	$2,900, TTM June 03

RCA line monitors
DVI/HDCP
Direct-view

34"	D34W20	$2,000, TTM June 03

7" RPTVs

40"	D40W20	$1,500, TTM June 03
52"	D52W20	$1,800, TTM June 03
56"	D56W20	$2,200, TTM June 03
61"	D61W20	$2,500, TTM Sept 03

W15 line
DVI/HDCP, 1080i/480p, 2 HD component, TTM current

40"	D40W15	$1,400
52"	D52W15	$1,700, ($1,300 Street Dec03)

Toshiba

(New lines announced on May 03)
Total of 29 sets and monitors in 9 categories, all w/DVI/HDCP, 1394/DTCP on the integrated sets conforming with CEA's "DTVLink" standard for AVC equipment interoperability.

LCoS technology Monitors
3-chip 1080p, dual NTSC tuners, DVI/HDCP, dual HD component in

57"	57HL83	$5,500, TTM Sep 03, Theater Wide
65"	65HLX83	$7,500 ($6,500 Aug 03), TTM Oct 03, Cinema Series

Toshiba announced that their LCoS line has been discontinued due to difficulties on chip availability, which affected the production plans of 2003 units.

The prices below are quoted as they were announced at product introduction (mid 03); Toshiba's press release at CES 2004 disclosed the same models, but at lower prices (between $300 and $500 lower depending on the line), however, the cost difference between monitors and integrated sets has still been maintained.

Theater Wide Fully integrated Sets are all CRTs
Split cabinet design, ATSC/QAM tuners (no CableCARD), Gemstar's TV Guide, dual DTVLink (1394/DTC) inputs, DVI/HDCP, multicard slot for JPEG image viewing for SD and Smartmedia flash media formats, Power focus HD2 CRTs, CableClear DNR + analog-to-digital video processing, Theater Net IR/1394 ICON Control system, 720p input capability, 540p/1080i native

51” 51H93 $2,700, TTM Aug 03
57” 57H93 $3,000, TTM Jul 03($2,700 street Dec 03)
65” 65H93 $3,500, TTM Aug 03

(65H93)

Cinema Series Fully integrated sets CRTs
TTM Aug 03, ATSC/QAM tuners, same as Theater Wide (except for the Theater Net IR/1394 ICON Control system) plus PowerFocus HD4 CRTs, TheaterShield AR, an Accufocus automatic lens convergence system with 56 points and manual setting capability, MegaBrand super wide band video amp, 720P input capability, 540p/1080i native
51” 51HX93 $3,000
57” 57HX93 $3,300
65” 65HX93 $3,800

(65HX93)

Theater Wide Monitors
Except for tuners, features are similar than above Theater Wide integrated
42” 42H83 $1,700, TTM May 03, ($1,500 street Sep 03)
46” 46H83 $1,800, TTM Jul 03, ($1,700 street Aug 03), 1080i, IDSC Pro offers 720P display capability, 3:2 pull-down, 2 component in
51” 51H83 $2,100, TTM May 03, ($1,900 street Aug 03, and $1,800 street Sep 03), Dynamic Quadruple Focus, 2 HD component in, 3:2 pull-down
57” 57H83 $2,400, TTM May 03, ($2,200 street, $2,000 street on Sep 03), 3:2 pulldown, digital autoconvergence
65” 65H83 $2,900, (also seen announced as $3,500), TTM Jul 03

Cinema Series Monitors, Powerfocus HD4 CRTs, Powerfocus HCF Achromatic Lens System, Mega Band wideband video amplifier, Theater Shield AR, Crystal Scan HDSC 1080i, Cable Clear DNR+, Touch Focus, Accufocus 56 point manual convergence, Theater Net IR ICON system, 720p input capability, 540p/1080i native
46” 46HX83 $2,100
51” 51HX83 $2,400
57” 57HX83 $2,700
65” 65HX83 $3,200

(Announced CEDIA Sep 03)
LCD FPTVs
TLP-720/721 1024x768, 2400 lumens, integrated 802.11b wireless connectivity
TLP-791 1024x768, 3000 lumens, document camera with 1392x1040
TLP-D2 1024x768, 2500 lumens, 5.3 lbs

Vidikron
D-ILA line
Vision Model 60 $15,000, TTM Spring 04, 3-chip unit (0.7 inch each), 1400x768, native 16x9, 17.9 foot-Lamberts, 1000 ANSI lumens, 800:1 CR, DVI/HDCP, DVI/HDCP, lamp life 2000 hrs, component, VGA D-sub 15 pin, RS-232

LCD projector line
Vision Model 100 $25,000, TTM Spring 04, 1366x768, 900:1 CR, 3 LCD panels, 4000 ANSI lumens with dual UHP lamp, native 16x9, 69.3ft-lamberts, 2000 hrs lamp, DVI/HDCP, component, VGA D-sub 15 pin

Zenith
New LCD
(Announced Apr 03)
52" model # N/A $N/A, 1920x1080p, TTM N/A, perhaps later renamed as below.

RPTV Monitors
TTM 4Q03, 3:2 pull-down, HD component
45" R45W46 $1,200
40" R40W46 $1,000

(Announced at CES 2004)
LCD RPTVs
Units shown lacked black and white definition, and had screen door effect
44" RU-44SZ80L DVI/HDCP
52" RU-52SZ80L DVI/HDCP
60" current size to be discontinued by 3Q04
44" E44WLCD monitor, 1280x720, 14" deep

New CRT RPTVs (seven models on the line)
To be manufactured again in Mexico this year
Integrated w/ATSC and QAM tuners
45", 50", and 57"
Monitors
40", 45", 50", and 57"

Analysis and Status of DLP

Texas Instruments (TI) announced a new 1080p DMD chip (xHD3), and showed their new DMD chip HD2+ with Dark Chip 2 (Filler Mirror Via, or "dimple fix"), introduced in September 2003.

The HD2+ was released to improve contrast and black level, include Digital Video Enhancement (DVE) that adds a dark green segment on the color wheel to improve bit depth and shadow detail, reduced sparkly dither at low levels, and closer pixel fill which produces a smoother image with less screen door effect.

Some manufacturers are also using the newly designed 7-element color wheel, to improve the known DLP dithering artifact.

TI talked about a 1920x1080 chip informally at CES 2002/3, and again at CEDIA in Sep 03, but CES 2004 was the event that demonstrated a consumer HD RPTV built with the xHD3 1080p chip (Samsung RPTV set), which according to TI, offers the finest in picture quality with the new DynamicBlack™, DarkChip2™ and SmoothPicture™ technologies, and up to 5000:1 CR.

Featured at the TI's booth was also a DLP RPTV "flat panel" cabinet from Thomson/RCA, as thin as 6.85" in depth, which claimed to be higher resolution, a smoother picture, higher contrast, richer, more detailed blacks, and truer colors.

These are 1-chip implementations; 3-chip implementation eliminates the color wheel artifact known as "rainbows", and provides a wider color range and more light output, particularly useful for larger screens.

According to Runco, black levels using DLP technology in a front projection application now surpass the black level achieved with film projectors.

Digital Cinema

By May 03, the total number of installed DLP-Cinema theatrical projectors in the world was more than 150; and more than 55 movies have been released in the standard. As an example, according to information on a recent interview of a Digital Cinema professional, some commercial-cinema DMD chips run for $170,000 and the lamp runs for $6,800 (or $4,600 with trade-in).

As an example of local projectors in the area of Virginia, there is one DLP Digital Cinema Theater (Multiplex of Arlington Blvd.) that last year has invested over $400,000 on their DLP projector.

One interesting experience they had was the event of one dead pixel that did not show on a white screen but did show as red color when the screen went black, a technician had to come over to service the equipment, probably replacing the faulty DMD chip.

When there was a DLP presentation, the movie has been brought to that theater by a technician, the movie is recorded in a HDD, which is installed as the HDD of the projector; all the equipment is bolted to the floor and locked, and the content is encrypted, for security reasons.

Currently, that movie-house is the fourth largest house of the complex; the last movie shown there was "The Last Samurai" and lasted only two weeks, then they deleted it from the HDD, for contractual reasons. Many people from other states traveled long distances to visit this movie house, as far as from Georgia, to experience the high quality of DLP Digital Cinema.

Large-Venue DLP Projectors

Other than the DLP projectors used by Digital Cinema movie theaters, large-venue projectors are used when high brightness and high quality images are needed for large screen commercial applications; the projectors also feature 3-chip DLP™ technology. These type of projectors are optimized for graphics and video (as opposed to the appearance of film of the Digital Cinema types), and are often found at rock concerts, at major product launches, at ceremonies like the Oscars, in churches, in casinos, etc.

According to TI, the main differences between DLP large venue projectors and DLP-Cinema projectors are:

- "The DMDs used in DLP Cinema™ applications have a special coating applied which enables contrast ratios in excess of 1,000:1 (compared with ~450:1 for 'regular' high brightness projectors).
- Color processing: In order to more precisely replicate the appearance of film, DLP Cinema™ technology uses 42-bit processing to allow the delivery of up to 35 trillion colors.
- While 'regular' DLP™ technology uses various frame rates for graphics and video, DLP Cinema™ technology electronically replicates the 24fps (frames per second) motion of film".

TI's Technical Innovations

The following are some of TI's innovations shown at CES:

DynamicBlack™: Dynamically optimizes picture quality, providing deeper black levels with incredible detail in dark scenes and a contrast ratio of 5000:1.

DarkChip2™: The next generation of DLP's widely acclaimed

DarkChip™ technology, it offers dramatically increased contrast ratio to provide increased depth, picture sharpness, and true blacks and whites

SmoothPicture™: Combined with our cutting-edge third generation of 720p and 1080p chips, it offers the ultimate in picture quality, providing a smooth, seamless image

HD2+: the latest enhancement to HD2 product line, it offers DarkChip2™ which enhances contrast for rich and detailed dark scenes

HD3: the next generation DLP chip, offers improved contrast and features DarkChip2™ and SmoothPicture™ technologies

xHD3: the first in the x-series of products, it offers 1080p resolution and the finest in picture quality with DarkChip2™ and SmoothPicture™ technologies

DLP Production Line

Regarding production lines, according to TI's announcement of January 8th, 2004, the company DongbuAnam Semiconductor will increase capacity this quarter for the CMOS chip production of the DLP subsystem. This would enable TI to nearly double the CMOS production for DLP™. Amkor, the company that partners with TI DLP Products for DLP test and assembly, is expected to triple its capacity on 2Q04.

Using its own facilities, TI will still manage the phases of production, CMOS, superstructure, and test and assembly, and continue to be the sole producer of the proprietary superstructure phase, with more than 2.5 million DLP subsystems shipped to manufacturers of DLP HDTVs.

xHD3 1080p Chip Implementation

Concerning the 1080p single chip implementation for consumer applications, TI generalized that they would expect manufacturers to release products using their new chip later in 2004, first on RPTV type of sets, then on FPTV projectors.

They estimate the RPTV products could cost consumers in the order of $4,000. TI's statement above is an indication that the chip might already be on the hands of manufacturers, so they can meet their 2004 production schedule for the products to be available as estimated by TI, and for those to be announced sometime later in the year.

One actual indicator of that assumption is that Samsung has informally disclosed their plans for releasing 1080p DLP versions of their 50", 56", and 61" RPTVs by July 2004, at a price not available yet.

Samsung also indicated that they are planning to release the 1080p FPTV projector version in the November 2004 period. Both informal announcements confirm TI's generalization now from a manufacturer's view. In other words, DLP 1080p is finally here, and at very reasonable price.

Both TI and Samsung declared that they expect the 1080p products to occupy the price range that 720p DLP HDTVs had when released a couple of years ago; they also expect the 720p sets to go down further in price, to become very competitive with other lower cost technologies, such as CRT RPTV. 720p displays could soon be at the $1,500/$2,000 price range, while the 1080p could be in the $4,000/$6,000 depending on the screen size.

DWIN informally declared that, in theory, there is not much of a difference on their work of building a FPTV projector based on a 1080p TI's chip, compared to what they do today for a 720p chip. Although this was, again, an informal statement.

No detail was provided further than that remark, but they felt that the 1080p version cost should be mainly governed by how much TI charges them for the 1080p chip price jump (transferred to the consumer by the TV's manufacturer, with their mark-up).

Until the products are out, it is uncertain how much the chip and final TV products would actually cost the consumer, but it is certainly promising that we finally have the chance for the 1080p DMD chip to be available shortly, offering one more option to those HD viewers that look for equipment that is truly capable to display the full 1080px1920.

This technology is also a good match with the soon to be available HD-DVD (or Blu-Ray, or EVD, or WMV HD), and the D-VHS media available today. Consumers would be able to view high resolution content with no compromises on the display device.

Although, having now more devices that are able to display the full 1080x1920 resolution, we hope that we will not be subjected to signal quality constraints from multi-casting, satellite and cable over-compression, or from camera and distribution resolution limitations.

Owning true 1080p-software content, and been able to display it to its full resolution, would dramatically accelerate HDTV adoption, not necessarily for the reason of TV, but for experiencing high quality video in your own HD home theater.

DLP RPTVs and FPTVs

Accurate Imaging Technologies (AIT)

(Announced Oct 03)
First two FPTV DLPs
Accurate BR-5 $6,000, 6.4 pounds, 1024x768, internal scaling, 3:2 pull-down, 1000 ANSI lumens, DVI/HDCP, RGBHV, component, 2000:1 CR
Accurate BR-7 $TBA, TTM Oct 03, 1280x720, other specs same as above

Barco

(Announced Sep 03 CEDIA)
RLM G5 3-chip DLP, 4500 lumens, Mercury XGA DMD engine, dual UHP lamps, 55 pounds

CineVersum FPTVs
Stylish European design
CineVersum 120 $50,000, TTM 2Q04, 3 16x9 DMD chips, 1280x720, 1500/3000 ANSI, 2500:1 CR, includes "The Master" video processor, screen sizes 90-150 inches
CineVersum 100 $40,000, TTM 1Q04, 3 16x9 DMD chips
CineVersum 80 $20,000 (incl. Master proc.), TTM 1Q04, single chip, +$5,000 for Pro-Lens
CineVersum 70 $13,000, TTM 1Q04, single chip
CineVersum 60 $8,000, TTM 1Q04, single chip 1024x576, 900 ANSI, 2000:1 CR

BenQ American Corp.

(Announced Sep 03 CEDIA)
FPTV EDTVs
PB6100 $1,000, 800x600 native, 1500 lumens, 2000:1 CR, 3000 hrs lamp life
PB6200 $1,700, 800x600 native, 1700 lumens, 2000:1 CR
PB2120 $1,200, 800x600 native, 1200 lumens, 2000:1 CR
PB2220 $2,500, 1280x1024 native, 1700 lumens, 2000:1 CR
PB7220 $3,600, 800x600 native, 2200 lumens, 2000:1 CR
PB7100 $1,700, 800x600 native
PB7200 $2,700, 800x600 native
PB8230 "combo" home theater/office, 1024x768, 2500 lumens
PE8700 (on CES 2003 report)
PE7800 $7000, TTM Mar 04, Matterhorn DMD chip 1024x756, DVI, component i/p, component HD, 2000:1 CR, 800 ANSI lumens, digital keystone correction, 6-segment color wheel, four independent color adjustment operations
PE8710 Digital Home Theater Projector, $7000, HD2+ DLP chipset, new generation optical engine, 7-segment color wheel, 2500:1 CR, 900 ANSI lumens, 300kHz refresh rate, 30dB audible noise level, native 16:9 resolution at 1024 x 768, HDTV compatible

CASIO

FPTVs
Compact portable design, high brightness for normal viewing conditions
XJ-350 2200 ANSI lumens, 9"x 7"x 2'size configuration
XJ-450 2800 ANSI lumens, letter-sized footprint, distance from screen as close as 32" for limited space environments

Crystal View Inc.
FPTV
CV-HD720P $17,000, HD2, 1280x720, 2300:1 CR, DVI, component

Digital Projection, Inc
Professional Audiovisual market and hi-end HT applications company
FPTVs
IVision HD 16x9 DMD at 1280x720, DVI-D, RGBHV (15 pin D-sub), component, 1000 ANSI lumens, 2300:1 CR, fan noise at 28db, 250 watt lamp, 6.5 lbs, 1.75-2.25:1 zoom lens

(Announced CEDIA Sep 03)
Mercury DLP projector $30,000, 1280x720, 1750 lumens, 2400:1 CR, three-chip Dark-Metal HD2, more compact than traditional xenon-lamped large-venue projectors and is aimed at the conference room market now dominated by LCD technology, DVI, component, RGBHV

Home Media Wall Multimillion pixel home entertainment and information display. Ability to window up to four applications in the large screen.

IVision SX 1280x1024, 3000 ANSI lumens

DreamVision
Distributed by Audio Plus Services in the US
(Announced May 03)
FPTV
DreamWeaver $11,000, HD2, Carl Zeiss optics, "invisible" cable management

(Announced at CEDIA Sep 03)
New FPTVs
DreamWeaver II 'Matterhorn' 1024x576 resolution, 16:9 aspect ratio, DCDI+™, Carl Zeiss optical, 8 video inputs, 1100 lumens, 1500:1 CR, available in three finishes: Black Titan, Glossy White and Silver Star
CinemaTenPRO 1024x768, 1100 lumens, 1100:1 CR, all-glass Carl Zeiss optics, video processor designed by DreamVision, 8 video inputs w/RGB through 5 BNC, DVI, digital keystone correction, learning remote control for ten other components. An optional long throw lens is available.

DWIN
FPTVs
TransVision 3-Plus $11,000, High-Definition Home Theater Projector System, 4th generation, HD2+ and controller, replaces Transvision 3 (included in the CES 2003 report), 10 video inputs, 1280x720, RS-232, 200 watt lamp, high contrast ratio, Carl Zeiss optics. According to DWIN, it is the only US-made two-piece projector delivering a DVI/HDCP 720p signal to the projector from the digital video processor.

TransVision 10 $23,000, TTM Apr 04, High-Definition Home Theater Projector, 3-chip HD2+ chips 1280x720, DWIN's video signal processing, deep black levels and natural color reproduction, no motion artifacts, and increased picture depth, six optional lens (from $2,500 to $3,500), power zoom, focus, and vertical/horizontal lens shift with remote control, two DVI/HDCP, separate video processor/scaler, 2 RGB, 2 component, initially the projector will be offered w/HD2 chips, systems offering the HD2+ chips will be offered based upon manufacturer's

availability, proprietary DVI cables (with DVI to Circular Cable, a type of in-wire multi-pin Din bridge connection between the two DVI ends to facilitate in-wall installations).

DuoVision dual display processor
10 video inputs (2 DVI/HDCP, 2 RGB, 2 component), 2 DVI outputs to connect with TransVision 10 and 50" PlasmaImage HD-50

Faroudja
New FDO-DLPHD20 $12,000, TTM current, 1280x720, 2800:1, HD2+, six segment color wheel, DCDi, component, RGBHV 15 pin D-sub, lamp life 8000 hrs, DVI

Gateway
56" SHD5610 (model # not confirmed)

$3,000, HD2 chip, 19" cabinet, TTM Nov 03, monitor, 1280x720, dual NTSC tuners w/dual DCDi for PIP, DVI/HDCP, RGB/VGA, two HD component in, brightness 400 nits, 1,000:1 CR, 6000 hrs lamp

Immersive, Inc
(Announced Aug 03)
Virtuoso HT720 $8,500, HD2, 2000:1 CR, 600 ANSI lumens, 1280x720, DCDi, DVI/HDCP, RGBHV, component

Infocus
(Announced Aug 03)
ScreenPlay 5700 $5,000, NextGen04, Matterhorn DLP chipset, 1,000 ANSI Lumens 1400:1 CR, DCDi, 3:2 pull:down, DVI/HDCP, RGB, 1024x576, recently named the 2003-2004 European Projector of the Year by the European Imaging and Sound Association (EISA), 220 watt lamp 3000 hrs (250 watt 2000 hrs).

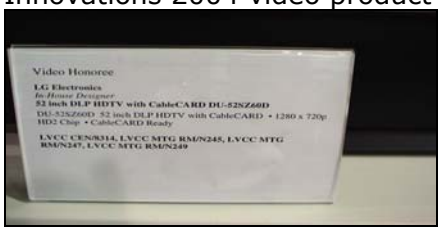
(Announced Sep 03)
ScreenPlay 4805 Replaces the 4800, $1,400, TTM Apr 04, DCDi, 848x480, 1100 ANSI lumens, 2,000:1 CR, DDP2000 technology, DVI/HDCP, RGB
ScreenPlay 7205 $10,000, TTM 4Q03, HD2+, DCDi, 1280x720, 1400:1 CR, 1000 ANSI, DVI, component, 3000 hr 220 watt lamp
LP120 Personal projector, XGA (1024x768), 2 pounds
DP1200x Proxima version, same specs.
DP8200x Proxima desktop/installation projector, 1024x768, 3000 lumens
LP820 Infocus version of above
Liteshow Plug-and-play 802.11b wireless for projectors having M1-DA or M1-D interfaces

(Announced at CES 2004)

61" ScreenPlay RPTV, $TBA, TTM 2H04, micro-display television, ultra-thin cabinet suitable to be hang on a wall, HD2 chip

LG
RPTVs
720p, 2 HD comp, DVI/HDCP, RGB D-sub 15 pin, 2 NTSC tuners
60" RU-60SZ30 $4,500
52" RU-52SZ30 $3,300

(Announced at CES 2004)
RPTVs
HD2 Mustang chip, 1280 x 720, built-in dual NTSC tuner, split-screen, PIP & POP, DVI/HDCP, component, RGB D-Sub 15 pin
Monitors
44" RU-44SZ60D $TBA, TTM Mar 04
48" RU-48SZ40 $4,000, TTM Mar 04
52" RU-52SZ60D $TBA, TTM Mar 04
Integrated with QAM w/CableCARD tuner, HD2 chip
48" $TBA, TTM Dec 04
52" DU-52SZ60D $TBA, TTM Jun 04, 1280x720, DVI/HDCP, 1394, honored as a CES Best of Innovations 2004 video product



56" $TBA, TTM Dec 04
62" $TBA, TTM Dec 04

FPTV
RD-JT30 $TBA, TTM 1H04, XGA native resolution, supports both 1080i and 720p, 1400 cd/m2 ANSI lumens, 1100:1 CR, DCDi, component, RGB, USB

Loewe Opta, Inc.
55" Articos $8,000 (Basalt and Platinum, $9,000 High Gloss Basalt), TTM 4Q03, 1280x720, custom-designed light engine co-developed with Carl Zeiss, HD2, Loewe video processing techniques, 1000:1 CR, six segment color wheel, DVI/HDCP, VGA D-Sub 15 pin, 2 component

Luce
(Announced May 03)
LDLP-720HDS $10,000, TTM July 03, HD2, 1280x720, hor/vert keystone correction (Sideshot) for up to 45 degrees off-axis horizontally, component, RGB D-sub 15 pin, DVI/HDCP

Marantz
FPTVs
VP-12S2 (successor of the 12S1 with 1200:1 CR), $12,500, TTM current, HD2 chip, DVI/HDCP, Minolta optics (for $4,500 extra, for 100" diagonal from 16-22 feet, Apr15), 2600:1 CR, 3 DCDi chipsets, component input, RGB, 1280x720, 720p, lab tests: lamp flicker problems detected after

300 hrs of use and 10 minutes of been on, it is apparently a lamp manufacturer problem (same as Sharp)
VP-10S1 projector $38,000, TTM Feb 04, three 16:9 HD2+ 1280 x 720 DMD chips, 12-bit processing DLP driver circuits, DCDi
VP-16 "high performance projector"

(Announced Sep 03 CEDIA)
VP-12S3 $12,000, TTM current, HD2+, 1280x720, 700 ANSI Lumens, 3800:1 CR, TTM Nov 03, optional long throw lens available for $16,000, 3:2 pull-down, DCDi, 2 component in, RGB, DVI/HDCP, 200 watt lamp, Minolta lenses, 10 bit digital gamma processing, long life lamp 2000 hrs average

Three-chip prototype projector shown at CEDIA.

Maxx
(Announced Sep 03)
FPTVs
Mustang $8,000, 1280x720, HD2, 2000:1 CR, 1000 ANSI lumens, 0.8 inch diagonal DMD, RGBHV, DVI/HDCP, component, TTM N/A, 2000 hrs 250watt lamp, 3000 hrs 200 watt mode lamp, vertical lens shift, Silicon Image Sil 504 chip
Maverick $5,000, 1024x768, Silicon Image Sil 504 chip, 2000 hrs lamp, DVI, RGBHV, component

Mitsubishi
(Announced Sep 03 CEDIA)
FPTVs
XD350 ColorView 1024x768, 2500 lumens
XD50U Mini-Mits 1024x768, 1500 lumens, micro portable
HC2 ColorView 800x600, 1100 lumens

RPTVs
65" WD-65100 $11,000 (on CES 2003 report)
60" VS-60XT2OU MegaView DLP projection cube, XGA (1024x768) resolution.

NEC Solutions
(Announced Sep 03 CEDIA)
WT600 super-short throw single chip DLP design, up a 100" 3x3 screen from 26" distant, 1024x768 DMDs, 1500 lumens, 3000:1 CR

HT1000 (on CES 2003 report)

(Announced at CES 2004)
LT10 2.1 pounds light projector, fit in a briefcase with a laptop, 1100 ANSI lumens of brightness, XGA native resolution, 2000:1 CR

LT170 3.9 pounds new projector, durable portability for mobile professionals, 1500 ANSI lumens, XGA-native resolution

Optoma
FPTVs
New H30 $1,400, TTM Sep 03; 2004 CES Innovations award winning projector

Widescreen-style home theater projector, VGA and component inputs, NO DVI, 800 lumens, 2000:1 CR, 4:3 DMD aspect ratio (16:9 compatible).

SVGA resolution 600x800, a 16x9 image actually uses 450 pixels of the 600 (but it still showing an excellent picture for the cost, the demo impressed as an HD image until you look at the SD specs)

2000 hrs lamp (3000 on eco mode), 32 dB noise level, image size 29 to 260 inches from projector distance of 4.1 to 32.8 feet, syncs to computer resolution of 1280x1024 (SXGA) and compresses, single 0.55 inch 12 degree DMD Double Data Rate chip, manual focus zoom, +- 16 degrees of keystone correction (vertical only), 4.6 pounds.

H56 $4,000 (on CES 2003 report)
H76 $6,000 TTM 3Q03, 1280x720 HD2 Mustang DMD chip, 16x9 chip, 5x color wheel, 2000:1 CR, 1000 ANSI lumens, DVI/HDCP, 2000 hrs lamp (3000 hrs at ecomode), UXGA resolution at compressed mode (1600x1200), 28 dB fan noise, vertical and horizontal Keystone correction, RGBHV, component, RS232, 16.5 pounds

(Announced Sep 03 CEDIA)
EzPro line FPTVs for business applications data
TTM current
725 1024x768, 2.1-pound, 1100 lumens
731 800x600, 1100 lumens, 4.5 lbs
737, 730, 735, 750, 753, 755, 757

RPTVs current
HD2 chip, native 16:9 aspect ratio, 1500:1 CR, true HDTV compatibility (up to 720p), TTM 2Q03, component, DVI/HDCP, RGB via BNC, (on CES 2003 report)
50” RD-50 $6,000, 14.8” deep, 90 pounds
65” RD-65 $7,000, 22” deep, 215 pounds

Panasonic
(Announced at CES 2004)
Four new DLP RPTVs
RPTV Integrated
ATSC/NTSC tuner, QAM CableCard unidirectional, HD2
60” PT-60DLD64
50” PT-50DLD64 $4,000
RPTVs Monitors
50” PT-50DL54 $3,500
60” PT-60DL54

Runco

Enhanced Gen 3 Reflection line

Dark Metal DMD chip, DVI/HDCP, PFP controller included, nine-point color balancing control, 1280x720, component, RGBHV, 2000 hrs lamp

VX-4000ci $20,000, TTM 2Q04, 6 lenses options, DVI/HDCP, variable CR 2500:1 to 3000:1, light output from 451-780 (1500 ANSI lumens)

VX-5000ci $27,000, TTM Nov 04, 1500 ANSI, 2500/3000:1 CR, 5-lens option,

VX-1000ci $17,000, TTM current, 1500 ANSI lumens, 2500/3000:1 CR

Other current models on CES 2003 report

(Announced Oct 03)

Video Xtreme Family

Dark Metal 3 chip DMDs, offered in four distinct versions (720p, 960p, 1024p and 1024 2.35)

VX-4c $70,000/$100,000, 1024x1280, 700-watt Xenon lamp

VX-6c $90,000/$120,000, 1024x1280, 1.2 Kwatt lamp

VX-2c $TBA, TTM 1Q04, 1280x720

New Video Processor

(Announced Nov 03)

DHD-12 $7,000, TTM 2Q04, Vivix II processing, outputs 480p, 576p, 720p, 1080i, 3:2 and 2:2 pull:down, 2 DVI/HDCP outs, and DVI/HDCP, component, RGBHV and SDI inputs

New Runco models

(Announced Aug 03)

CL-510 $6,000, "Matterhorn" chip 1024x576, Gen 3 optical system, 3:2 pull: down, 17.8-foot lamberts (900 ANSI lumens), 1700:1 CR (CSMS CR 149:1), RS-232, DVI/HDCP, 1.75-2.0 throw

CL-510LT $7,000, longer throw version of above (2.3-3.0:1)

(Announced Jun 03)

CL-710 $10,000, 1280x720, HD2, 1,500:1 CR, DVI/HDCP, integrated scaling and video processing w/3:2 pull:down, 1000 ANSI lumens, 1800:1 CR, 1.4-1.6 throw

CL-710LT $11,000, longer throw version of above (1.85-2.4:1)

Samsung

Monitor models (announced at CES 2003)

To be available on April 03 to replace the HLM line, HD 2 chip, 1280x720, DNIe (Digital Natural Image Engine) video enhancer (in addition to DCDi), 3:2 pull-down, DVI/HDCP, XGA PC 15 pin input, 2 HD component, scroll and stretch functions

43"	HLN437W	$3,500
50"	HLN507W	$4,200 ($4,000 street Sep03)
61"	HLN617W	$5,200 (Innovations), one 480p component in
46"	HLN467W	$4,000, TTM 2Q03, DCDi, DNIe, released Jun 03, $3,800 street Sep 03
56"	HLN567W	$4,700, TTM 2Q03, DCDi, DNIe, released Jun 03, $4,300 street $ Sep 03
43"	HLN4365W	$3,700, 77 pounds, 15 inches deep
50"	HLN5065W	$4,200

2003 Integrated model

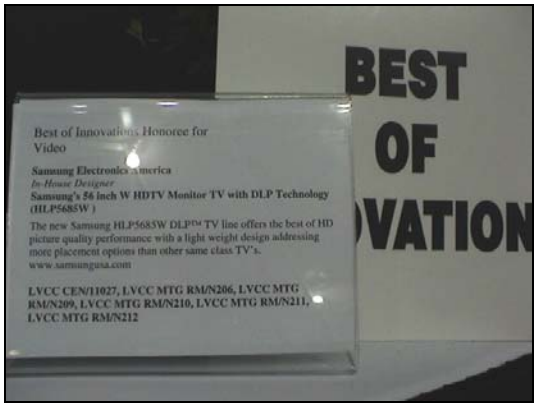
61" HCN691W $6,000, TTM 4Q03, exact model as HLN617W but with tuners ($500 more)

New FPTV
(Announced Aug 03)
SP-H700A, $12,000, HD2+ chip, TTM fall to dealers, also seen as $10,000, 1280x720, DVD-D/HDCP, 2 compon, 700 ANSI lumens, 1,800:1 CR in Bright Mode (550 ANSI and 2,000:1 CR in Theater Mode), 250 watt UHP lamp that is rated as 2000 hrs life, 15 pin RGB D-sub, DCDi FLI2300, developed in consultation with Joe Kane conforms to color space of CIE specifications

(Announced at CES 2004)
Floor Standing Designer Series Monitors

New pedestal design with a vertical mounted DLP light engine, cabinet depth 13", HD2+ chip, DynamicBlack™, 3000:1 CR, enhanced contrast for rich and detailed dark scenes
50" HLP5085W
56" HLP5685W $N/A, TTM May 04, DNIe Gen 3 Light Engine, 1 DVI, 1 HDMI, 1 PC input, dual tuner PIP, DCDi, winner of CES' Best of Innovations 2004 for the video category.

Comments on CES demo: unfortunately, the unit showed too high contrast, edging, and excessive pixelization artifacts; it is assumed that the unit was not properly calibrated.



RPTVs HD3 Series (monitors)
First DLP TV utilizing next generation DLP HD3 chip, DarkChip2™ and Cinema SmoothPicture™, increased brightness, 1500:1 CR, smooth and seamless picture (TI said), TTM Mar/May 04
46" HLP4663W $3,500
50" HLP5063W $3,800
56" HLP5663W $4,300
61" HLP6163W $4,600

Slim Bezel pedestal DLP RPTV line
Ultra slim bezel, similar than Floor Standing line, TTM Jun 04, HD2+, 3000:1 CR, HDMI, DNIe
46" HLP4674W (model could not be confirmed)
50" model #N/A $4,500, under 12" deep
56" HLP5674W $5,000
56" HDP5677W $4,900, TTM May 04 (model could not be confirmed)

Integrated versions of the above two lines of monitors will have ATSC/QAM CableCard tuners, 1394/DTCP and HDMI/HDCP for additional $500 later in 2004. The first half of 04 will be monitors, 2nd half will introduce cosmetically identical models with ATSC tuners.
52" HLP5256W $N/A, TTM later 04, integrated w/ATSC/QAM tuners, DNIe, 2 comp, HDMI

New xHD3 1080P RPTV sets
To be available by Jul 2004 on 50" 56" and 61" sizes at estimated prices ranging from $4,000 to $6,000; later, in November there will be FPTV projectors using the same xHD3 1080p chip, at an undisclosed price.

Sanyo
(Announced Sep 03 CEDIA)
1:1.5 zoom lenses for the education market
PLC-XU50/55 1024x768, 2000/2500 lumens
PLC-SU55 SVGA, 2000 lumens
Desktop/portables under 20 pounds, 1024x768
PLC-XT16 3500 lumens
PLC-XT11 2650 lumens

PLC-XP55/L 4500 lumens
PLC-XP50/L 3600 lumens, lens not included
PLC-EF13N/L 5800 lumens
PLC-XF13N/L 5200 lumens

RPTV cube
50" SVD-50D1S 1280x720, 24" in depth.

Sharp Electronics Corporation
FPTVs
Sharpvision XV-Z10000U $10,000 (report of performance comments, below)
TTM Dec 02, DVI/HDCP (also PC compatible), two switchable contrast ratio modes: 2500:1 CR with 600 ANSI lumens of brightness, or 1500:1 CR with 1000 ANSI lumens of brightness, CV-IC II video processing, RS-232, 2 component in, PC D-sub 15 pin, 2000 hrs lamp, TI HD2 chip, lab tests: lamp flicker problems detected after 300 hrs of use (and 10 minutes of been on), it is apparently a lamp manufacturer problem.

(Announced Oct 03)
XV-Z12000U $12,000, TTM Dec 03, HD2+ chip, 900 ANSI lumens, 1280x720 native, ALPS technology (expanded control of contrast and brightness), DVI/HDCP, manual zoom, lens shifting, "film tone" mode, 61 step-color temperature adjustment, six-position picture setting memory function, adjustment functions for gamma, Sharp's proprietary Computer & Video Integrated Composer (CV-IC II) System technology, contrast ratios between 3000:1 and 5000:1, 900 ANSI Lumen brightness in high brightness mode

XV-Z200U $4,500, TTM Jan 04, EDTV "Matterhorn" chipset, 1024x576, update of the XV-Z90U, 2000:1 CR, 800 ANSI lumens, 5000 hr lamp, 30dB audible noise, DVI-I, component, RGB, targeted for 100" screen large space 4.3-5.2m
DT-300 $4,300, TTM Jan 04, EDTV "Matterhorn" chipset 1024x576, 2000:1 CR, 700 ANSI lumens, targeted for first time projection-user of smaller space 100" screen, 2.6-3.2m
PG-A20X 2000 lumens, 1024x768, 6.4 lbs
XG-C55X 3000 lumens, 1024x768, 11.2 lbs

Sim2 Multimedia
(Announced Oct 03)
Domino Line
DCDi, motorized zoom and focus, digital keystone adjustments
Domino 20 $6,000, "Matterhorn" 1024x576p DMD device, 2000:1 CR focus adj +/- 10%, digital keystone adjustments of +/-38% vertical, and +/- 14% horizontal
Domino 30 $9,000, HD2, 1280x720, 2000:1 CR

Grand Cinema line
HD2+ chip, 2,800:1 CR, 28% black level improvement over original HT-300 model, DCDi, DVI,
HT-300Link $15,000, second generation DigiOptic Image Processor (DOIP) with HDMI, and can connect as far away as 1,600 feet

HT-300Xtra $12,000

Grand Cinema RTX RPTV new line
HD2 Mustang chip, 1280x720, DCDi, 1800:1 CR, 6000 hrs lamp,
45"
55"

Studio Experience
(Announced Sep 03)
Premiere 50HD $10,000, TTM Sep 03, DCDi, 3:2 pull-down, 1000 ANSI lumens, 1700:1 CR, DVI/HDCP, 1280x720 HD2 16x9 chip

Synelec
(Announced CEDIA Sep 03)
84" LM-1200 1280x1024 SXGA display DLP cube that is the largest currently available (according to the manufacturer).

Indisys 16 Gb/s Ethernet backbone all-Digital Control room solution

Theater Automation Wow (TAW)
(Announced Apr 03)
Stealth FPTV $14,000, $15,500 w/HD-Rock Scaler, $19,000 w/Rock Pro scaler, HD2

Thomson/RCA
(Announced May 03)
New Integrated RPTVs
ATSC/QAM tuners, HD2, 1280x720, built-in web browsers, DVI/HDCP, pair of 1394/DTCP 2-way inputs (DTVLink)
44"
50" HDLP50W151 $4,500 TTM Aug 03, 16 inches cabinet depth, 92 pounds
61" HDLP61W151 $5,000 TTM Oct 03, 19 inches deep

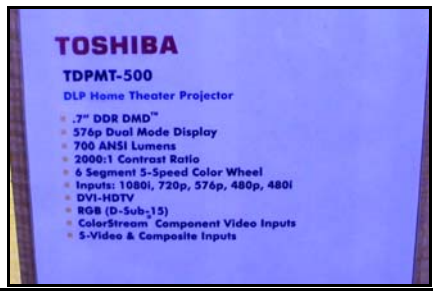
(Announced at CES 2004)
Scenium Ultra-thin integrated
6.85" depth designed for hang-in-wall applications, patent-pending InFocus light engine, the flat panel category within DLP, sleek ultra-thin design, 2-way 1394, HDMI/HDCP, TTM Jul 04, HD2 chip, ATSC/QAM CableCARD tuners that will detect broadcast-flag
50" HD50THW262 $9,000
61" HD61THW263 $10,000
70" HD70THW263 $N/A, TTM later in 2005

Scenium Integrated
ATSC/QAM w/CableCARD/NTSC tuners, TTM Jul 04, 160 degree viewing angle, component, HDMI, 1394, HD2 chip, controls DVR functions of optional DVR2080, (reasons for high prices could not be confirmed, and RCA did not respond before press time)
44" HD44LPW163 16.3" deep
50" HD50LPW163 16.6" deep
61" HD61LPW163 19.6" deep

Comments about CES demo: the image showed pixelization activity on edges of objects and on fast moving images. TI booth's rep did not know if the reason was the content, the TV itself, or a combination of both.

Toshiba
(Announced at CES)
Toshiba will introduce 10 DLP RPTV models later this year using the HD2+ chip, whit thin-cabinet designs.

(Announced Jul 03)
TDPMT-500 $3,500, 1024x576, 2000:1 CR, keystone correction, gamma control, preset and user definable color temperature controls, independent color control, memory settings by input, DVI/HDCP, 2 Colorstream component inputs, "Matterhorn" chipset



(Announced Aug 03)
TDPMT-800 $10,000, TTM Mar04, HD2+, 2,200:1 CR, 1,100 ANSI, Carl Zeiss all glass optics, seven segment color wheel

(Announced Sep 03 CEDIA)
DLP projection cubes
38" P380DL 1024x768, 400 nits
60" P600DL 1024x768, 300 nits

V, Inc.
(Announced at CES 2004)
RPTV
56" Velite 5600R $4,500, TTM Mar 04, Mustang HD2 chip, 1280x720, DVI/HDCP, DCDi

Vidikron
Old Vidikron FPTV models (prior to Runco)

Rubino $5,000, 1000 ANSI lumens, 800x600/848x480
Amica $9,000, 1280x720, 900:1 CR, component in, RGB/component via BNC, VGA 15 pin
MBX-1 $250,000, 3 DLP chips, super-wide 2:35:1 images, Apr 15

New Vidikron line (after Runco)

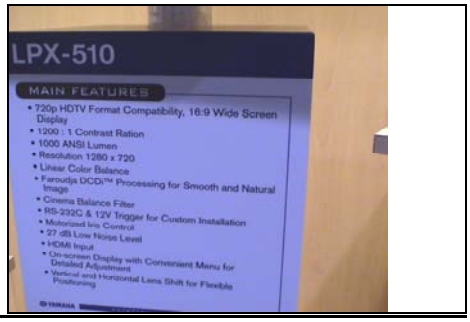
Vision Model 20 $5,500, TTM June 03

HD2, 1024x576, 850 ANSI Lumens, 1500:1 CR, DVI/HDCP, ET Model for $6,500 with longer-throw lens option, 3:2 pull-down, component, and 96" wide recommended maximum screen size, 2000 hrs lamp

Vision Model 40 $9,000, TTM June 03, HD2, 1280x720, 950 ANSI lumens, 1600:1 CR, DVI/HDCP, ET model for $10,000 for longer-throw lens

Yamaha

LPX-510 $5,000, TTM May 04, 720x1280, 1000 ANSI, 1200:1 CR, DCDi, HDMI



DPX-1100 $12,000, TTM Apr 04, 1280x720, 800 ANSI, 4000:1 CR, DCDi, HDMI, HD2+ chip

Zenith

RPTVs

HD2 Mustang DMD, 1280x720, dual NTSC tuners, DVI/HDCP, split-screen, PIP and POP

44” E44W46DP $TBA, TTM Mar04

52” E52W46DP $TBA, TTM N/A

(Announced at CES 2004)

44” RU-44SZ51D $TBA, TTM Mar 04, DVI/HDCP, 1000:1 CR, 0.8 chip

52” DU-52SZ51D $TBA, TTM May 04, integrated w/ ATSC and QAM CableCARD, 1394, HDMI

Plasma Panels

Akay
(2003 models announced during the year)
42" SPDP490 $3,500, TTM Apr 03, ($3,000 street Sep 03), 480p EDTV
42" PDPH4298 $4,000, TTM current, 1024x0124, comp, D-sub 15pin, BNC, NTSC tuner
50" PDP50L50 $7,000, TTM current, 1366x768, comp, D-sub 15 pin, NTSC tuner
50" PDP50S50 $7,000, same specs as above

(Announced at CES 2004)
42" PDPH4295 $3,500, TTM Feb 04, 1024x1024, component, DVI/HDCP
42" PDPH4297 $3,500, TTM Feb 04, 1024x1024, component, DVI/HDCP
50" PDPH5090 $6,000, TTM current, 1366x768, component, DVI/HDCP
60" PDPH6090 $13,000, TTM Feb 04, 1366x768, component, DVI/HDCP

Apex Digital first plasma display
(Announced Mar 03)
42" PL-42HD12W $4,000, TTM late 03 or 2004, 852x480 (or 1024x1024 not confirmed), 550:1 CR, 480i/p/720p/1080i inputs, deinterlacing w/3:2 pull-down, DVI/HDCP, RGB via VGA, component

Bang & Olufsen
50" BeoVision 4 $13,000,768x1366, TTM current, component

BenQ
46" PDP46W1 $6,000, 1024x852, HD comp, BNC, D-sub 15 pin, DVI, NTSC tuner

Crystal View
(Announced at CEDIA Sep 03)
1000:1 CR, outboard processor included, RGB, HD component
43" CV-43HD $13,000, 1280x768
50" CV-50HD $17,000, 1280x768

Daewoo
(Announced Aug 03)
42" DP-42SM $2,900 street

(Announced at CES 2004)
50" DP-50GM $7,000, TTM Apr 04, 1280x720, component

DWIN
50" HD-50 PlasmaImage $12,000, TTM 4Q03, video controller (included) connected via proprietary DVI Circular cable, 1366x768, 10 video inputs in controller (2 component, 2 RGB, 2 DVI/HDCP), 3000:1 CR, 600 cd/m2 brightness, 3:2 pull-down

63" HD-63 PlasmaImage $TBA, TTM 1Q04, same inputs/controller as above

Elite Video
61″ EV-61HD $17,000, 1365x768, RGB, BNC, component, DVI-D, TTM current

Faroudja
Include NRS processor ($6,000 for optional DVD player and DCS – Digital Cinema Source), VGA D-sub, DVI, component, RGBHV
61″ FPP-61-HD10 $30,000 w/ processors options above, 1365x768
50″ FPP-50-HD10 $20,000 w/ processor options above, 1365x768, 3x digital zoom, TTM TBA
42″ FPP-42-HD10 $13,000 w/processors options above, 1024x768

NRS-DCS Processor

New Processor at CES
DVP4000 Digital Video Processor that converts 1080i to 1080p before scaling to the resolution of the display device, integrated DVD drive, 1080p via DVI

New Plasmas at CES
Bundled with either the DVP1500 or the NRS-DVI video processor
42″ FPP-42WV20 $10,000, 852x480
42″ FPP-42HD20 1024x768
50″ FPP-50HD20 1366x768
61″ FPP-61HD20 $36,000,1366x768

Fujitsu
Plasmavision SlimScreen
TTM current, DVI/HDCP, HD component in, RGB, Advanced Video Movement (AVM) processor for motion artifacts and better vertical resolution, built-in line doubler for NTSC signals, AliS (Alternative Lighting of Surfaces), 20W stereo amp w/ext speaker outs, accepts 1080i/720p
50″ P50XHA10 $11,000

3000:1 CR, 1366x768, 600 candelas per meter squared of brightness, UXGA (1600x1200) computer input

42″ P42HHA10 $8,000, 1024x1024, 1000:1 CR, 1000 cd/m2 brightness

New Panel monitors
(Announced Sep 03)
AVM (Advanced Video Movement digital video processing), DVI-D/HDCP, stereo amps w/optional speakers, RS-232, TTM Jan 04, $TBA, 60,000 hours lifetime, 2 component, VGA, incl.processor
63″ P63XHA30WS $25,000, AliS, 1000 cd/m2, 1366x768, 10-bit signal processing
55″ P55XHA30WS $15,000, AliS, 1000 cd/m2, 1366x768, 10-bit signal processing
50″ P50XHA30WS $11,000, 1366X768
42″ P42HHA30WS $8,000, 1024X1024
42″ P42VHA30

Gateway
42” GTW-P42M102 $2,500, EDTV, 852x480, DVI (NO HDCP) for PC, VGA 15 pin D-sub, 2 HD component in, NTSC tuner, 480i> 480p w/3:2 pull-down, VGA output, 600:1 CR
42” Ultrabright $3,000, EDTV, same as above w/1000:1 CR
42" HD Plasma $4,500, HDTV, 1024x1024, 1000:1 CR, 1000 cd/m2 nits, DVI
46" model # N/A $3,300, EDTV, 852x480, 600:1 CR
50" DTW-P50M203 $6,000, HDTV, 1366x768, 600:1 CR, 600 nits, DVI (HDCP enabled for 480p), VGA, 2 component in, NTSC tuner, 2:3 pull-down, included stand, wall mounting gear $280 extra

Gridiron
(Announced Sep 03)
50” Model # N/A $8,000 street, 1366x768

Hitachi
Ultravision Panels with Control center packages
DVI/HDCP, 2 x HD component, 2 NTSC tuners
42” 42HDT50 $8,000, 1024x1024,TTM 3Q03
42” 42HDT55 $8,300, same as above
50” 50HDT50 $11,000, 1280x768, separate A/V switcher/tuner module, TTM current, all virtual HD 1080p processing
50” 50HDT55 $11,500, same as above

Director Series
(Announced Sep 03)
Gloss silver cabinets, TTM 4Q03, DVIHDCP, 2 x HD component, 2 NTSC tuners
42” 42HDX60 $9,000,
50” 50HDX60 $12,000

Monitor only
Director Series
42” 42HDM70 $9,000, TTM 4Q03
Professional Series
42” CMP4201/2U $8,000, TTM 4Q03
50” CMP5000U current model will continue

(Announced at CES 2004)
55” 55HDM71 $10,000, TTM early 2004, 1366x768 display resolution (WXGA), through Hitachi's VirtualHD(TM) 1080p digital video processor up-converts all incoming non-native signal sources up to 1080p before conversion to native 768, DVI/HDCP, component and RGB video inputs, split screen, four-color temperature memory, black and white film color temperature, four-step black enhancement, digital 4MB 3D Y/C comb filter and optional side mountable speakers

Jamo
(Announced at CES)
42” HDP4250 $N/A, TTM N/A, 1024x1024, system with DVR50 receiver w/DVD and A3 loudspeaker system

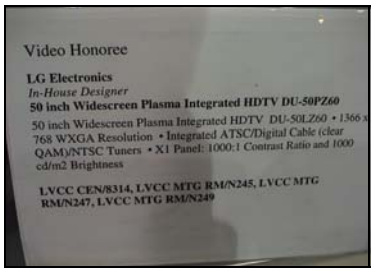
JBL
50" CinemaVision $15,000 (includes dealer delivery and setup), TTM Spring 04, monitor panel plus A/V system controller with five-disk DVD changer and multi-channel digital amplifier

JVC
(Announced Feb 03)
42" PD-42WX84 $6,500, 1024x768, DVI/HDCP, DIST for 770p conversions, Natural Cinema 3:2 pull:down, 1 NTSC tuner, 1394, TTM current, 2 component in
42" PD-42WX74 $5,000, 853x480, DVI/HDCP, 2 component in

2003 Professional Products Models
(Announced Jul 03)
50" GD-V501U $10,000, TTM July 03, 3000:1 CR, 1366x768, 3.9 " thick, CATS for contrast adjustment to environments, gamma correction circuitry
42" GM-P420UG $6,000, 853x480, 370 cd/m2 brightness, 1,500:1 CR, RGBHV, 15 pin D-sub, 720p/1080i supported

New Plasmas announced at CES 2004
Integrated w/ATSC, QAM w/CableCARD (JVC still calls it POD)
1024x768, DIST, internal upconversion to 770p, HD Digital Super Detail (DSD) edge enhancement for still/fast/slow motion, HDMI/HDCP, 2 component in, 1394 connections
42" PD-42X795 $6,000, TTM Jul 04
50" PD-50X795 $9,000, TTM Jul 04
Monitors w/Optical HD Transmission (Luciole system)
1024x768, DIST, data wirelessly transmitted at a 1.5Gbps rate at 10 meters range, internal upconversion to 770p, HD Digital Super Detail (DSD) edge enhancement for still/fast/slow motion, HDMI/HDCP, 2 component in
42" PD-42X995 $6,000, TTM Sep 04
50" PD-50X995 $9,000, TTM Sep 04

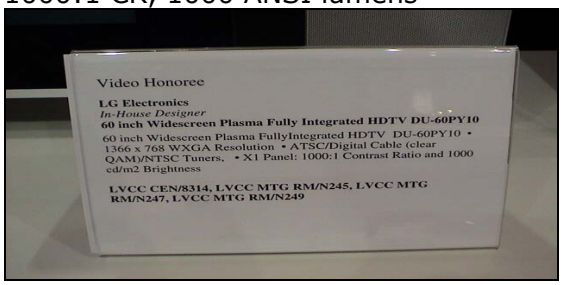
LG
Integrated panels
42" DU-42PZ60 $8,000, TTM 4Q03, ATSC and NTSC tuners, RGB, DVI/HDCP, HD component, DCDi, 1024x768
50" DU-50PZ60 $11,000, TTM 4Q03, ATSC/QAM on-the-clear and NTSC tuners, RGB, DVI/HDCP, HD component, DCDi, 1366x768, 1000:1 CR, 1000 ANSI



Monitor only panels
42” RU-42PZ90 $4,700, NTSC tuner, 1024x768
50” MU-50PZ90V $10,000, TTM 4Q03, 1366x768
60” MU-60PZ90V $15,000, TTM 4Q03, 1280x720

The following are the new plasma panels (prototypes) at CES 2004
Would probably be released w/built-in ATSC tuners
LG did not setup the two panels below with enough viewing distance relative to their screen size, but even then, they both showed impressive quality and definition at just 2/3 feet from the screen.
1080px1920:
71” model # N/A estim. at $25,000, TTM Nov 04, 1500:1 CR, 900 cd/m2, 1000x1684x81 mm
76” model # N/A estim. at $30,000, TTM Jan 05, first announced at Korea Electronics Show of mid Oct 03, over 2 million pixels, 800 cd/m2, 1000:1 CR, 1794x1061x81 mm

Y Series Models Integrated
With ATSC/QAM cable on-the-clear tuners, DVI/HDCP
60” DU-60PY10 $TBA, TTM Oct 04 (also reported as Apr 04, probably incorrect), 1366x768, 1000:1 CR, 1000 ANSI lumens



50” TTM Aug 04
42” TTM Oct 04

There will be also another series “I” and “G” with 3 models each

60” P60W38 TTM N/A, 1366x768, DVI/HDCP, DCDi (could not confirm this model)

Loewe
42” Spheros 42 PL $11,000, TTM now, 1024x1024, 2 NTSC tuners, DVI/HDCP, RGB 15 pin D-sub, HD component
42” Spheros 42 B $12,000, TTM now, 1024x1024, 2 NTSC tuners, DVI/HDCP, RGB 15 pin D-sub, HD component

Luce
(Announced May 03)
Two new integrated panels
ATSC tuner, Analog CATV and NTSC tuners, STBs are not required, DCDi, 2 component, DVI/HDCP, VGA 15 pin D-sub, selectable color temperature (6500/8000/9300 user adjustable), RS-232 control
42” PDTV-42HDA $7,500, TTM June 03, 1024x768, CR: 1000:1 V2 / 3000:1 V3, brightness: 830 V2 / 1000 V3 cd/m2

50” PDTV-50HDA $10,500, TTM July 03 (also seen announced as $12,000 Sep 03), 1366x768, CR 950:1 V2 / 3000:1 V3, brightness: 820 V2 / 1000 V3 cd/m2

Monitors
42” PDTV-4203A MK II $7,600, 853x480, component, NO DVI
42” PDTV-4220A $7,500, 853x480, component, NO DVI, 2000:1 CR, 700 cd/m2
61” PDTV-6100A $25,000, monitor, TTM current, 1280x720, HD component, 500:1 CR, color temp adjustment, DVI/HDCP, RGB D-sub 15 pin, 2 NTSC tuners

Marantz
42” PD4240D $8,500, TTM current, 1024x768, DVI/HDCP, scaler/deinterlacer, 7 inputs
42” PD4293D $6,000, TTM Apr 04, 853x480 EDTV, 1500:1 CR, RS-232, DVI/HDCP, BNC
42” PD4220V $6,500, TTM Apr 04, 853x480 EDTV, DVI/HDCP
50” PD5040D $14,000, TTM Nov 03, 1365x768, DVI/HDCP (perhaps the same as above)
61” PD6140D $21,000, TTM Jan 04, DVI/HDCP, 1365x768, built-in scaler/deinterlacer, 7 video inputs, RGB, component,

Maxx
50” 5050 $9,000, TTM current, 1366x768, DVI optional, component, D-sub 15 pin
60” 6100 $20,000, TTM current, 1366x768, DVI optional, component, D-sub 15 pin

Mitsubishi
Platinum Series
Upgradeable, DVI/HDCP, 2 HD Component
42” PD-4225 $6,000, TTM Jan 04, 852x480, EDTV

50” model # N/A $TBA, 1024x768

Diamond Series (monitors)
DVI/HDCP, RGB, HD component
42” model # N/A $7,500, 1024x768
50” PD-5030 $12,000, 1365x768
61” PD-6130 $21,000, 1365x768

Monivision
46” PD46W00 $5,500, TTM current, 1280x768, RGB 15 pin D-sub, HD component

NEC

61″	61XM2	$20,000, 1365x768, DVI (CEDIA Sep 03)
84″		Four 853x480 PDPs

NetTV

50″	PDP-50X	$8,000, 1366x768, DVI/HDCP, RGB 15 pin D-sub, component

Norcent

42″	PT420	$3,200, TTM current, 1024x1024, DVI/HDCP, component
50″	PT520	$7,000, TTM, current, 1365x768, DVI/HDCP, component

(Announced Apr 03)

42″	PT425	$N/A, TTM current, 1024x1024, NTSC tuner, DVI/HDCP
46″	46WVGA850	$4,000, 852x480, DVI
46″	46PXGA1800	$6,000, 1280x768

Orion

(Announced CEDIA Sep 03)

84″	NeoDigm	tiled plasma made up of four 853x480 PDPs

Panasonic

(Announced Sep 03)
Two new plasmas (according to CES Panasonic they are now discontinued)
Dual NTSC tuners, HDMI/HDCP, 3 component inputs, 1024x768

42″	TH-42PX20	$6,500, TTM Sep 03
50″	TH-50PX20	$9,000, TTM Oct 03

(Announced Sep 03 CEDIA)
Two other new plasmas (according to Panasonic they are now discontinued)
Proprietary plug-in video interface modules (as with the 50″)

42″	TH-42PWD6UY	852x480
42″	TH-42PHD6UY	1024x768

(Announced at CES)
New Viera PX25 Series plasma HD integrated
HDMI/HDCP, ATSC/NTSC/QAM w/Cable CARD tuners, 3000:1 CR, PC input, photo viewer card slot

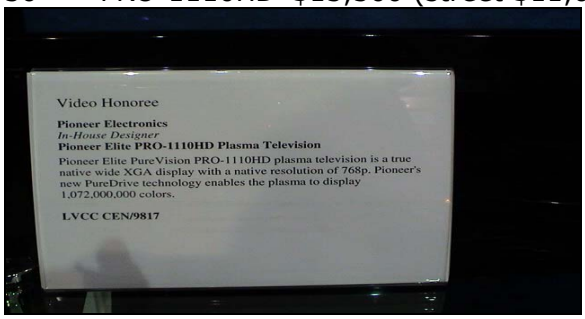
37″	TH-37PX25U	$5,000, TTM Jun 04
42″	TH-42PX25U/P	$6,000, TTM Apr 04, 99mm deep
50″	TH-50PX25U	$8,500, TTM Apr 04

New Viera PD25 Series plasma EDTV integrated
480p, ATSC/NTSC/QAM w/CableCARD tuners, 4000:1 CR, PC input, HDMI/HDCP, photo viewer card slot

37″	TH-37PD25U	$4,000, TTM May 04
42″	TH-42PD25U	$4,500, TTM May 04

Pioneer
(Announced Sep 03)
TTM Oct 03, with stand alone media receiver w/ATSC tuner with digital connection to panel, VGA 15 pin D-sub, two HDMI/HDCP, HDTV compatible 720p/1080i, Advanced Pure Cinema with 3:3 film-to-video conversion at 72Hz, 1394 on integrated models, "Media Receiver approach"

Purevision Regular line (integrated)
43" PDP-4340HD $10,500, 1024x768
50" PDP-5040HD $14,500, 1280x768
Elite Purevision line (integrated)
Same specs as above line, ISF calibration mode via RS-232
50" PRO-1110HD $15,500 (street $11,000/$12,000 Oct/Dec 03), 1280x768, TTM Nov 03



43" PRO-910HD, $11,500, 1024x768
Elite Purevision line Monitors only
RGB, component, 2 HDMI
50" PRO-1000HDI $13,000, 1280x768, (monitor only version)
43" PRO-810HDI $9,000, 1024x768

(Announced at CES)
Four new two-piece plasmas
TTM summer 04, integrated ATSC/QAM/NTSC tuners within the external "Media Receiver"
43" to 50" $ TBA, two Elite versions

By second half of 2004, the "Media Receiver" will include QAM w/CableCARD unidirectional

One-piece integrated versions by 2005 models

Princeton Graphics
46" AR46PDP $5,000, EDTV 852x480, DVI, NTSC tuner

Planar Systems
50" PDP-50P $7,500, 1280x768, DVI-D, VGA 15 pin D-sub, component
60" PDP-60B $14,000, 1280x768, DVI-I, component, VGA D-sub w/adapter for DVI

Revox
DVI, HD component, BNC, TTM current, optional NTSC tuner
42" E1042 $10,000, 1024x1024
50" E1050 $14,000, 1280x768

Runco
New models
(Announced Aug 03)
Vivix Processing, DVI/HDCP, 1,000:1 CR
42" CW-42MC $8,000
43" CW-43MC $10,000, 1024x768
50" CW-50MC $14,000, 1280x768
61" CW-61MC $25,000, 1366x768, 2 RGB, component

Sampo
Theater Pro models
(Announced Apr 03)
Integrated but TV tuners optional
42" PME-42VC10 $N/A, 852x480
42" PME-42XC10 $N/A, 1024x768, non-square
50" PME-50XC10 $N/A, 1366x768

Samsung
(Announced Oct 03)
70" PS70X4H $25,000-$30,000, TTM spring/summer 04, 1080x1920, less than 4 inches deep, fanless design

(Announced Sep 03, CEDIA)
42" PPM42S3
50" PPM50H3
63" PPM63H3 plasma monitors

63" HPN6339 $20,000, TTM current, 1366x768, DVI/HDCP, component, image expansion modes with vertical positioning, no separate external A/V control center required, optional stand or wall-bracket $350 each, 153 lbs, 3.5 inches deep, lab test on Dec 03 showed picture jitter on 1080i sources (720p and 480p were very good), claimed as the world's largest plasma.

Announced at CEDIA Sep 03
63" P63XHA $25,000
42" SPN4235 $4,500, ($4,000 street $ Dec 03), 852x480, fan less, NTSC tuner
42" HPN4239 $6,000, 1024x768, fan less, NTSC tuner
50" HPN5039 $9,000, 1366x768 ($8,000 street $ Dec 03), DNIe, dual NTSC tuner

(Announced at CES)
New Integrated Plasmas
1,000 cd/m2 brightness, 3000:1 CR, DNIe

42" HPP4271 $6,000, TTM Apr 04, 1024x768, integrated w/ATSC/QAM/NTSC tuners, HDMI, DVI, 1,000 cd/m2 brightness, 3000:1 CR, DNIe

50" HPP5071 $8,000, TTM Apr 04, 1366x768, integrated ATSC tuner, 3000:1 CR, 1000 ANSI, DNIe, HDMI, DVI

63" HPP6371 $TBA, TTM TBA, integrated w/ATSC/QAM/NTSC tuners, 1366x768, 1000:1 CR, 700 ANSI, DNIe, HDMI, DVI

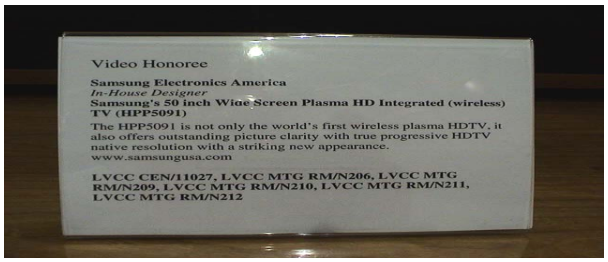
70” HPP7071 $TBA, TTM 4Q04,

Integrated w/ATSC/QAM/NTSC tuners, 1080px1920, 1200:1 CR, 800 ANSI, DNIe, HDMI, DVI

50” HCP5085W integrated w/ATSC/QAM w/CableCARD, 2 component, DNIe, HDMI

Wireless Plasma

50” HPP5091 $13,000, TTM Jun 04,



1366x768, 802.11a Wi-Fi networking, HDMI, HD-STB that transmits wirelessly the signal to the set (w/ATSC/NTSC tuner), 3000:1 CR, 1000 ANS

New plasma prototype

80” HPP8071 $N/A, TTM late 05, integrated w/ATSC/QAM/NTSC tuners, 1080px1920, 2000:1 CR, 1000 cd/m2, DNIe, HDMI, DVI

Sony

New integrated models XBR Plasma WEGA series

(Announced June 03)

TTM October, ATSC/QAM tuners (unscrambled), Direct Digital II video processing, iLink/DTCP for D-VHS, DVI/HDCP

42” KDE-42XBR950 $8,000, 1024x768

50” KDE-50XBR950 $11,000, 1365x768

61” KDE-61XBR950 $20,000

New mid-range XS Plasma WEGA series
(Announced June 03)
TTM fall 03, NTSC tuners, DVI/HDCP, 1 HD component
37" KE-37SX910 $6,500
42" KE-42SX910 $7,500
50" KE-50XS910 $10,000, TTM winter 2003/4, DVI/HDCP, twin surround system, many XBR features, ATSC/QAM tuner, floating screen design

Thomson (RCA)
Scenium
(Announced Jun 03)
DVI/HDCP, 2 HD component, RGB
42" PHD42600 $6,500 (Also seen as $5,500) 1024x1024, TTM fall 03
50" PHD50500 $10,000, 1280x768, TTM spring 03

Toshiba
42" 42HP83 $7,000, 1024x 768, 1,000:1 CR, DVI, Crystal Scan HDSC, CableClear DNR+ video noise reduction, color temperature control (Aug 03)

V, Inc.
(Announced Jun 03)
46" Vizio P4 $4,000, 852x480 SD plasma, 800:1 CR, NTSC tuner w/speakers, DVI (non-HDCP on first generation, yes on second), RGB, component, 3:2 pull-down, 6 settings for AR adjustment, no fan.

(Announced at CES 2004)
Velite Line
42" 4250P $4,500, TTM Mar 04, 1024x768
42" 4200P $3,500, TTM Feb 04, EDTV, Faroudja deinterlacing

Vizio Line
NTSC/cable tuners, titanium/silver finish, PIP, POP, 3:2 pull:down, tabletop stand, remote
42" Vizio P42 $3,000, TTM Mar 04, 852x480 EDTV, component, DVI/HDCP, RGB
50" P50HD $5,000, TTM Apr 04, 1366x768, component, RGBHV via VGA, DVI/HDCP

Vidikron
(Announced Oct 03)
PlasmaView line
4" depth, Dynamic Pixel Protection circuitry (for burn in), DVI, multiple AR control, 3:2 pull:down, 1000:1 CR (1200:1 for the 42"), brightness 1,000 cd/m2, 2 component, DVI/HDCP, RGB via BNC, RS-232
42" VP-42HD $10,000, 1024x768, TTM Feb 04
42" VP-42 $6,500, 852x480
50" VP-50 $12,000, 1365x768, TTM 1Q04
60" VP-60 $20,000, 1365x768, TTM 1Q04, 5 inches deep

Viewsonic
42″ VPW-450HD $5,000, 1024x1024, DVI/HDCP, RS-232, HD component, RGB 15 pin, 3:2 pull-down

Yamaha
42″ PDM-4210 $7,000, monitor, TTM Mar 04, Natural Black Drive System, component, RGB, computer input, RS-232

Zenith
42″ P42W38 $TBA, TTM 3Q03, 1280x768
50″ P50W38 $9,000, TTM 2Q03, 1366x768, 1000:1 CR, 1000 cd/m2
60″ P60W38 $15,000, 1280x768, DVI

(Announced Jun 03)
42″ P42W39 $TBA, TTM 3Q03, 1280x768, integrated
50″ P50W39 $TBA, TTM 3Q03, 1365x768, integrated
60″ P60W26H $15,000, TTM current, 800:1 CR, 600 cd/m2

Video Processors that Upscale to 1080i/720p

ADS

ADS Tech HDTV Upconverter $600, TTM current, 9 inputs (3 component, 3 S-Video, 3 composite, with L/R audio each, RF cable, component out w/L/R audio acts as a video switcher), upconverts 480i/p to 480p/720p/1080i, film mode detection, 9 bit A to D conversion, full color controls, PIP, advanced format conversion (Anamorphic, panoramic, letterbox, Pan-Scan and crop, pillar box, expand)

Personal comments on demo: unfortunately of unacceptable quality, possibly originating from a combined effect of poor demo environment, screen, non-calibrated projector, DVD itself (an exaggerated reddish version of Spiderman, a second improved a bit); with such deficient setup it is difficult to determine if the upconverter was a good performer.

Note that the switching of audio is just of analog L/R, and that the unit does not have DVI or HDMI inputs/outputs; the low $600 cost provides a logical reason of such limitations.

In summary, further controlled viewing in a good environment is needed to evaluate performance, although a lab test would be preferred to commit to this unit, even at $600.

DVDO

iScan HD $1,500, TTM Feb 04

Upconverts 480p/720p/1080i/p, Pan and Zoom, source-adaptive and motion-adaptive deinterlacing, individual picture control per input including brightness, hue, saturation, sharpness, and Y/C differential delay.

Frame-rate conversion and full frame Timebase correction, automatic Chroma Upsampling Error (bug) correction, automatic source activity detection and selection by priority pre-sets, precision AV LipSync to match audio soundtracks to video.

Two component ins, 1 DVI-D in, 4 digital audio ins (2 optical Toslink, 2 coaxial RCA), 2 S-Video ins, 2 Composite ins, 1 DVI-D out, 1 RGB D-sub 15 out, 2 digital audio outs (1 optical Toslink, 1 coaxial RCA), RS-232 port fro software/firmware upgrades, infrared remote control with direct access codes, built-in test patterns for easy setup, future-proof design with upgradeable software.

Faroudja
Digital Cinema Source Processors/Advanced Scalers TTM current

Digital Cinema Source DVP2000 $15,000

DVI input/output (NO HDCP yet, as reported recently), updated Digital Cinema Source (DCS) with Faroudja's processing, includes a DVD transport (processing in digital domain skipping A-D conversion step of typical scalers), DCDi w/3:2 pull-down, 1 HD-PC D15 male input, 1 component/RGB input on BNC, 1 RBGHV output on 5 BNCs and D15 female, "TrueLife" two dimensional non-linear luma/chroma video enhancer, HD transcoding YPbPr to RGBHV, HD RGB to DVI conversion, temporal and recursive 3D video noise correction, supports the following resolutions:

852x480, 800x600, 1280x1024, 1280x768, 1360x1024, 1024x768, 1280x720, 1366x768, 960p, 1920x540p, 1920x1080p, and Alis plasma panels, (underlined are the features absent of the other regular Digital Cinema Source unit below). DVI is not supported for 852x480, 960p, 1920x540p, and 1920x1080p.

Digital Cinema Source $10,000, DVI in/out, RGBHV, YPbPr, RGB BNC, DCDi, HD transcoding YPbPr to RGBHV, AR control, internal DVD drive, DVI not supported for 852x480 and 1920x540p, otherwise supports all the resolutions of the DVP2000 above (except the ones underlined).

Native Series Processor NRS-DVI $4,000, TTM now (sep 03) updated, DCDi w/3:2 pull-down, scaling fitted at factory to operate at "any" specific scan rate, DVI input/output, component in/out, "TrueLife" two dimensional non-linear luma/chroma video enhancer, HDTV transcoding from YPbPr to RGB

New Processor announced at CES
DVP4000 Digital Video Processor that converts 480p/720p/1080i to 1080p before scaling to the resolution of the display device, integrated DVD drive, 1080p via DVI, matched to fixed pixel displays native resolution (LCD, plasma, DLP) to optimize performance.

Key Digital
(Announced Sep 03)
New HD Leeza scaler
KD-HD1080p $4,000, TTM July 03

Scaling to 480i/p, 576i/p, 720p, 1080i/540p, and 1080p), firmware upgrade via Internet, two DVI/HDCP, one Digital SDI 270Mb/s, one RGBHV (can also pass-through), two Component Video (YPrPb) one SD (NTSC & PAL: 480i, 576i) one HD (480p, 576p, 720p, 1080i/540p), two S-Video, two Composite Video, SDTV and HDTV up-, down-, and cross-conversion between 480p, 720p, 1080i/540p, and 1080p, Scaling SDTV and HDTV to 640x480, 720x480, 852x480, 1024x512, 800x600, 960x540, 1920x540, 852x576, 1280x720, 1024x768, 1280x768, 1366(5)x768, 1280x960, 1024x1024, 1280X1024, 1365x1024, 1400x1050, and 1920x1080; additional resolutions available via firmware upgrade, Film detection with inverse 3:2 or 3:3 telecine; supports 50Hz/75Hz with PAL sources and 2:2 pull:down, Scaler equipped with advanced, proprietary motion-assisted de-interlacing algorithm "Clear Matrix Pro", Dynamic Non

Linear Stretch Mode "Dynamic Stretch Xtreme" (DSX) included, Aspect Ratios in and out: 1.33, 1.66, 1.78, 1.85, 2.00, 2.35, and accommodates custom settings, DVI/HDCP out, RGBHV or YPrPb out, output refresh rates of 50 Hz, 60 Hz, 72 Hz, and 75 Hz for each resolution, one High Definition pass-through for RGBHV.

KD-FIRE1080P Scaler/HD-STB w/ATSC tuner $3,000, TTM current

HD-Set Top Box and scaler with Firewire. Equipped with the advanced, motion-assisted de-interlacing algorithm "Clear Matrix Pro". DVI-D inputs, and HD scaling via an optional daughter board card. Video decoding (including ATSC and NTSC), HD RGBHV and DVI/HDCP out, two IEEE 1394 Firewire I/O ports with 5C, upgrade firmware over the Internet, no fan noise, simultaneous HD and SD outputs from any source.

Inputs: two RF tuner inputs (both capable of ATSC and analog TV), two Component Video (YPrPb) (480i), one RGBHV pass-through, two Composite, two S-Video, RF inputs accept ATSC and analog TV (NTSC, PAL, PAL-M, SECAM) formats, four analog (standard line-type Left & Right pairs) audio.

Scaling and Processing: Scaling to 720x480i, 720x480p, 1920x1080i/1080p, 1280x720p, and 1280x768p, equipped with advanced, motion-assisted de-interlacing algorithm "Clear Matrix Pro", Aspect Ratios in and out: 16:9 and 4:3, HDTV and SDTV Colorimetry Matrix, 3-D Comb Filtering for Composite.

Outputs: one HD Component Video (YPrPb), one HD RGBHV, one DVI with HDCP, one SD Composite Video, two IEEE 1394 5C-enabled Firewire I/O ports supporting HDTV and SDTV, Audio: one analog (standard line-type Left & Right pairs), one digital PCM, one Toslink optical audio.

Runco

New Video Processor

(Announced Nov 03)

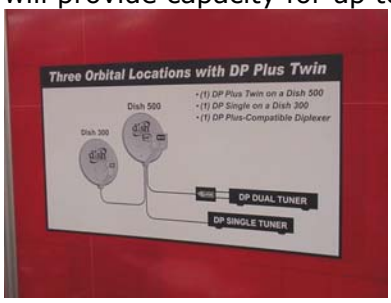
DHD-12 $7,000, TTM 2Q04, Vivix II processing, outputs 480p, 576p, 720p, 1080i, 3:2 and 2:2 pull:down, 2 DVI/HDCP outs, and DVI/HDCP, component, RGBHV and SDI inputs

HD for Satellite, Cable, and Broadcast OTA

General Review

Dish Network Superdish, Original Announcement of May 03

A new 26 inches "Superdish" for HDTV was announced that is able to receive 110 and 119, plus either the 105 or 121 slots. According to the official announcement, the new Superdish will provide capacity for up to 50 HDTV channels, primarily from the new 105-degree location.



Among the first new channels to use the "Superdish" will be HDNet and HDNet Movies, expected by summer. The "Superdish" should ultimately eliminate the need for a second dish for HDTV from Dish Network.

Also announced was the Dish Network 811 receiver (replaces 6000), as well as the 211 and 921 HDTV receivers. The Dish Network 811 HDTV receiver will retail for less than the 6000, but will ship with OpenTV, a faster EPG, integrated 8PSK and 8VSB, DishPro support, plus Firewire, DVI, and component outputs in a silver chassis Dish Network also announced new "Dish Pro Plus" technology that allows a single cable to support dual tuners, and integrates the DishPro legacy adapter, eliminating the need for an adapter to support older hardware.

- Superdish was announced to become available in July
- There will be a Superdish upgrade program (details in July).
- ~10 HD channels on Superdish at initial launch
- Most HDTV will be at 105, not 121.

Superdish update on Sep 03

EchoStar Communications Corporation will begin offering four channels of high-definition entertainment for $9,99 in Sep 16. The channels are ESPN HD, Discovery HD Theater, HDNet, and HDNet Movies. DISH Network also offers high-definition channels such as CBS-HD East/West, HBO-HD, Showtime HD, and DISH-On-Demand pay-per-view HD movies, HD Event channel and will continue to broadcast these channels on 61.5/148 and we will begin to simulcast these channels at the 105 location when SuperDISH becomes available.

Discovery HD Theater customers currently subscribing to Discovery HD Theater for $7.99 per month to call and upgrade to the new DISH Network HD programming package for only two dollars more per month.

Enhanced HD Adaptors: For those customers who have a model 6000 and would like to be able to receive the new HD programming, the Enhanced HD adaptors are available to consumers for $99. Shipping charges will be waived with subscriptions to the new DISH Network HD programming package. Customers who subscribe to the DISH Network HD Programming package and pay the annual payment will receive the HD adaptor free. The wholesale price for the adaptor is $39 with an MSRP of $99.

STB update

DISH Network's entry-level DISH 811 will be available this fall at an MSRP of only $399. The DISH Player-DVR 921 will be available for $999 by the end of October (actually started orders late December 2003).

SuperDISH hardware packages were announced for Nov 03. A 40" RPTV monitor or 34" direct-view monitor, a Dish 811, elliptical single dish for SD and HD channels, for $1,500. An upgrade for the 921 is available for additional $700.

HD package update at CES 2004

At CES 2004, EchoStar announced that it reduced the price of HD packages to $1,000 (or the step up w/921 for $1,600), with a commitment to subscribe to certain HD programming.

Voom HD Satellite Service

Cablevision thru its Rainbow DBS launched VOOM HD satellite service in the 4Q03 with 21 exclusive HD channels (to become up to 39 HD channels in all as of Feb/04). The system uses the Motorola DSR550 HD-STB that the company said would be upgradeable to PVR 580 wired-networked HD-STB in 3Q04 under an arrangement the company has not decided yet (Voom declared that it will take into consideration existing customers investment).

Ucentric is developing the PVR 580 for Voom, it would have at a minimum 250GB PVR networked with coaxial RG-6 to thin clients located at other rooms in the house. Clients are estimated to cost $50 for SD displays and $100 for HD displays. The service and installation is offered by Sears (or 1(800)GETVOOM) until the exclusive period that ends Feb 2004, at which time Voom will be looking for new retail partners.

The cost of the STB, 18" dish, a Channel Master antenna for OTA reception, and installation is $749. The Motorola box will be capable of decoding both MPEG-2 and MPEG-4 signals, and has an internal ATSC tuner for OTA reception.

The box includes component video outputs, DVI/HDCP, USB-2 jack for possible home network applications, S-video, there are plans to add 1394 to the next release of boxes (PVR 580), the first release (550) omit that capability, and will not be upgraded for that.

VOOM Motorola's STBs will have ATSC and NTSC terrestrial tuners to receive over-the-air digital and analog TV channels, local channels are said to be integrated within the same user interface. VOOM would initially broadcast in MPEG-2, with an eventual "customer easy" upgrade to MPEG-4 for 3Q04 (via firmware and a new STB card), to enable the broadcast of more than 200 channels, including at least 39 HDTV services.

DirecTV

(Announced at CES)

DirecTV announced that the company is taking over the complete responsibility for the sale and distribution of set-top-boxes for its satellite service, which will have uniformity of look and operation even when produced by different manufacturers.

DirecTV continues to exclude 1394 outputs from the new models (two introduced at the show are the RCA's DTC-210, TTM 1Q04, $600, and the Hughes HD-DVR250 DVR/Tivo, TTM Apr 04, $1,000).

DirecTV will be the only Multi-channel Video Programming Distributor (MVPD) company, not having 1394 outputs on their STBs. The FCC has mandated cable companies to supply STBs with 1394 connections to customers that request those (by April 04). Dish Network has just released the 921 PVR with 1394 outputs (which they said would be enabled early 2004). Voom showed their new STB (model 580) PVR/network with clients, all with 1394, to become available July 2004.

General Comment

Regardless of the HD service/equipment you use, look for 1394 outputs that would facilitate D-VHS recording, and DVI/HDCP (or HDMI/HDCP) digital outputs for connectivity with HDTVs having those inputs, which could allow you to view protected content if copyright restrictions were eventually implemented. Last's year CES report analyzed the subject in detail.

HD for Satellite, Cable, and Broadcast OTA

HD-STBs/PVRs

Dish Network

DISH211 (included in 2003 report, but unit seems that will not be released as planned; it is not even listed now on the CES 04 product brochure)

DISH811

$400, TTM Dec 03, ATSC OTA/satellite tuners (one each) DVI/HDCP, NO 1394, component out, NO RGB out, replaces Dish 6000, NO PVR, tuner module included inside the unit, same selectable outputs of model 921, converts formats to any output, 2 days of electronic program guide, optical digital audio out, also offered as part of a package that includes a 34" direct-view monitor or a 40" RPTV monitor for $1000.

PVR 921

(Innovations CES 2003 best of show winner), $1,000, original TTM was for 2Q03 (actual TTM was Dec 03), although the unit has been announced as ready to release for almost 2 years.

HD-PVR with a 250 GB HDD, up to 180 hrs SD, up to 25 hrs HD, one DVI-I/HDCP, two 1394/DTCP to be enabled via future software upgrade, dual satellite tuners, ATSC OTA tuner built in, one component out, 2 USB ports for future use (such as remote keyboard), records DD when available and over the air digital broadcasts, headphone and USB jacks in front panel, records up to two programs in the PVR simultaneously (HD or any) while capable to play another HD program stored in the PVR (or from the 3rd HD tuner).

Also offered as part of a package that includes a 34" direct-view monitor or a 40" RPTV monitor for $1600, 9 days electronic program guide, optical digital audio out, 30-second skip for commercials, four fast-forward and fast-rewind speeds, picture-in-picture, multi-device remote control, selectable output from the menu for 480p/720p/1080i, stores signal in original resolution. Some users reported that the HDD is always turning. Beta testing reports are available on the Web.

Hughes

HTL-HD $500, TTM Nov 03 (unit apparently offered for $99 temporarily by DirecTV)

ATSC and DirecTV tuners, similar to HD300 from Sony and 3200A from LG, but IR remote, DVI, component, optical digital audio (no coaxial), VGA D-sub 15 in, switch in back for DVI/VGA, DVI cable, 720p/1080i switch (front button on box)

New HD-DVR250 $1,000, TTM Apr 04, w/HD Tivo, Best of Innovations CES 2004

2 ATSC + 2 DirecTV tuners (E* 921 HD-STB has only 3 tuners in total), HDMI/HDCP, component, 2 sat RF inputs, digital audio Toslink, 2 USB ports (for future use), 1 RF antenna that splits internally to two ATSC tuners, 250 GB DVR for up 30 hrs of HD recording or up to 200 hrs of SD recording, built-in fan, S-video out.

Pause live TV up to 30 minutes, DirecTV advanced program guide w/14 in advance (most PPV 24hrs in advance), multiple screen formats (standard, letterbox, panorama).

Selectable output for 480i/p, 720p, or 1080i (reportedly via soft button). Functionality to been able to pause, instant replay, rewind live TV and fast forward and playback recorded programs in normal speed, slow motion or frame by frame.

Can record two different programs from either DirecTV, ATSC or one from each, as well as watch a pre-recorded program at the same time. It records one HD program while watching another (requires connection of two satellite inputs from a triple LNB dish antenna). Simultaneous SD and HD output not specified (and assumed as NO). According to DirecTV, there are NO plans for a future 1394 output.

JVC
Dish Network/ATSC HD-STBs

TU-PVR9000RU $700-800 (estimated), TTM 2Q03, specs on the 2003 report, according to JVC this product will no longer be marketed

TU-DVR921RU $1,000, TTM Dec 03

JVC unit that pairs the Dish Network 921, 250 GB HDD, Dish Wire 1394 A/V connectors to use with select products, ATSC and NTSC tuners, DVI/HDCP, dual E* tuner 480i/p/720p/1080i outputs, DVR capacity for up to 180 hrs of SD or 25 hrs of HD, or a combination of both,

TU-6000RU included on CES 2003 report

MIT
MDR-200 $500 (Street $ 389), TTM current,

ATSC/NTSC tuners, scaler/switcher, component out, VGA, dual 1394 for D-VHS, 2 component 480i inputs, optical/coaxial digital audio outputs, 480p/720p/1080i selective outputs, RS-232

Mitsubishi
Original Promise Module:

"We will engineer and manufacture the upgrades necessary so the television you purchase today can be made compatible with near-future advances in digital television and digital interconnectivity. Specifically, we promise that you will be able to have your television upgraded, at a reasonable cost, to include an off-air HDTV tuner, a cable TV tuner (for unscrambled programming), an IEEE 1394 (FireWire®) connection, HAVi system control, and 5C copy protection".

HD-5000 Network Controller (Promise set top) $1,700, TTM current

Built-in ATSC/QAM (unscrambled) cable/dual NTSC demodulation tuners, controller/ATSC tuner also used for plasmas, new IR learning NetCommand 3.0 with FAV HAVi home networking protocols, three IEEE-1394/DTCP, one HD component (480p/1080i), RGBHV, two 480i/p component inputs, DVI/HDCP, output 480i/p, 720p, 1080i; 720p is routed native via the 1394 and DVI outputs, digital audio coax (DD 2 channel, passes through 5.1)

This unit facilitates early HDTV monitors with home networking capability and digital recorders connectivity even though their TVs lack digital interface connections, however, it does not provide those early HDTV monitors with the full digital connectivity available on newer DVI HDTVs, as follows.

The controller does NOT have a DVI input, which means that the solution offered by this unit as the promise for a " customer who wants all of the features and convenience of a top-of-the-line integrated HDTV" (as stated on the web-site), would not actually be met for DirecTV subscribers.

A subscriber of DirecTV, which STBs only use a DVI output as digital connection, who is also the owner of an earlier non-DVI HDTV model, could not use this Promise set-top-box to get the full benefit of the meaning of the "digital-connectivity promise", when the controller is not able to receive the digital signal of the DVI output of the DirecTV STB, so it can be send to the HDTV for viewing when the content is protected with HDCP.

This leaves the traditional component analog connection as the only choice available for this owner of a $1700 promise box. Such viewer of protected content could be subjected to possible copyright HD viewing restrictions when the content is sent via the component analog connection, if/when those restrictions are implemented.

Model HD-5 (this old unit was missed on the CES 2003 report), users reported a number of problems, Mitsubishi was refunding $500 so people can replace it by the Hughes model 86.

Motorola

STBs for Comcast
(Announced June 03)
Family of QAM cable STBs
DCT-6200

DOCSIS broadband cable modem, interactive video-on-demand, play and record SD and HD, DVI-D/HDCP, dual 1394/DTCP, TTM summer 03, component, 3 USB, Ethernet, optical/coaxial digital audio, 64/256 QAM,

DCT-6208 PVR with 80GB, 1394, DOCSIS
DCT-6212 PVR with 120 GB
DCT-6216 PVR with 160 GB

Family of Broadband Media Centers for home networking and Moxi Menu

BMC9012 HD-STB w/ 40GB PVR, TTM for cable operators 2H03

Two Analog/Digital/HDTV video tuners DOCSIS 1.0 cable modem, Ethernet, and OOB data receiver, 733MHz x86 CPU, 128MB DRAM and 4MB Flash, 3D Graphics processor with 32MB of dedicated DRAM, 40GB Hard disk drive with expansion via USB2.0 port Two USB1.1 and two USB2.0 ports, RF cable input and RF modulated TV output, composite baseband, S-Video, YPrPb, and DVI video outputs, Stereo, S/PDIF optical/coaxial digital audio outputs, Moxi digital reference designs, serve one/two TVs simultaneously, 1394/DTCP not specified (but announced).

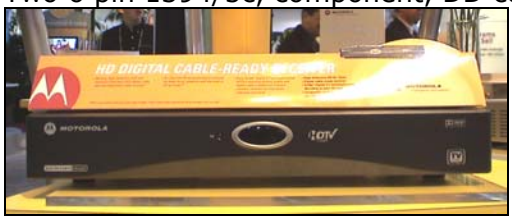
BMC9022D HD/STB w/80GB PVR, TTM for cable operators 2H03

Two TV support over existing home cable, DVD/CD player, Two Analog/Digital/HDTV video tuners, DOCSIS 1.0 cable modem, Ethernet, and OOB data receiver, 733MHz x86 CPU, 256MB DRAM and 4MB Flash, Dual 3D Graphics processor with 64MB of dedicated DRAM, 80GB Hard disk drive with expansion via USB2.0 port, two USB1.1 and two USB2.0 ports, RF cable input and RF modulated TV output, Composite baseband, S-Video, YPrPb, and DVI video outputs, Stereo, S/PDIF optical/coaxial digital audio outputs, 1394/DTCP not specified (but announced)

(Announced at CES)

HDT100 $300, TTM current, ATSC tuner, no 1394, no DVI, component, optical digital audio

HDT300 $800, TTM 1Q04, ATSC tuner, QAM w/Cable Card (unidirectional only), DVI/HDCP, Two 6 pin 1394/5c, component, DD coax/Toslink, RS-232



HDT500 $1000, TTM 4Q04, 160 GB PVR expandable via 1394, same features as 300

Motorola estimated informally that approximately $500 worth of STB components is incorporated into the QAM tuners of integrated HDTVs, for the QAM w/CableCARD unidirectional functionality.

According to Motorola, the future implementation of bi-directional QAM CableCARD would require a new box with different circuitry for internet functionality and return channel to the cable company, upgrades on existing unidirectional STBs for such features was not considered to be possible.

Pace Micro
(Announced June 03)
No plans for retailing direct sales (only via cable operators)
DC-550 HD TTM June 03 by Time Warner, DVI/HDCP, component analog out, 1394/DTCP as option (Time Warner elected to omit it on the initial order)

DC-755 HD TTM current, based on Motorola conditional access system, DVI/HDCP, component out, 1394/DTCP as option, DOCSIS cable modem included

Panasonic
TU-DST52 $399($340 Oct 03), ATSC/OTA only, component, selectable output 1080i/480p/480i (no 720p reported) controlled by remote, DD optical, No DVI, No 1394, no simultaneous 1080i/480i, NTSC line-doubler reported as missing

Pioneer
Voyager 4000 HD-DVR TTM 4Q03, Expanded connectivity, component, S/PDIF, USB, optional 80GB PVR, 15 Hrs of HD, 50 hrs of SD, TTM 4Q03, DVI/HDCP, 1394/DTCP, Pioneer's Echo Passport software for onscreen guide tools

RCA
DTC200 Unit postponed on May 03, then, on Sep 03, the unit was apparently scrapped entirely due to some design problems; $700, ATSC/DirecTV tuner, advanced program guide, DVI/HDCP, NO 1394, component out, RGB+HV 15 pin D-sub VGA, coax & optical Dolby Digital audio out, selectable resolution of 1080i/720p/480p/i outputs, TTM 1Q03, simultaneous output to 480i connections w/ component signal

ATSC10 $549, ATSC only, TTM 1Q03, RGBHV on 15-pin D-sub, HD component out, DVI/HDCP, NO 1394, coaxial and TosLink DD audio out, output resolution switchable to 1080i and 720p

(As per Press Release May 22, 03)
Both units below: DVI, 1080i/720p/480p/I output, simultaneous 480i, audio optical/coaxial outputs, component, RGB 15 pin D-sub adapter (unconfirmed)
ATSC11 $449, TTM summer 03, ATSC tuner only, no NTSC tuner
ATSC21 $499,TTM summer 03 (was still unreleased by Nov 03), ATSC/NTSC tuners, $50 extra for NTSC tuner over the model ATSC11

DVR10 PVR $449, TTM Summer 03, 80GB HDD, enough for 9 hrs of HDTV recording or 40 hrs SD, when connected to any two-way IEEE 1394 device such as the new line of RCA and RCA Scenium HDTV Sets, the RCA DVR10 can record and store HDTV.

Dish Network HD satellite STB
HD6000 $492, TTM current, component, RGB, optical digital audio

(Announced at CEDIA Sep 03)
DTC-210 $600 (offered for preorder at $529), TTM 1Q04, DirecTV and ATSC tuner, DVI/HDCP, multiple output formats 1080i, 720p, 480p/i, component and 15 pin D-sub, simultaneous 480i, coaxial/optical DD audio outputs, integrated electronic guide

Samsung
2003 model announced Jun 03
SIR-T351 $449 ($400 street), TTM current

ATSC tuner, output selectable as 1080i, 720p, 480p and 480i formats, component out, DVI/HDCP, digital audio optical/coaxial

SIR-TS360 $599, TTM Feb 04, DirecTV/ATSC tuners, DVI, RGBHV, component, simultaneous SD and HD output, selectable 480p/720p/1080i outputs, 7 day EPG

The current models 160 and 165 are included on CES 2003 report.

Scientific Atlanta
3250HD $500 (as of Sep 03), rented by cable company, TTM 4Q02,

DVI (was not activated as of Sep 03), 1394 optional, component out, RGB adapter, selectable video resolution, USB port, AR control, coaxial digital audio out

3270HD $500, TTM fall 03, 3rd generation STB, 64 and 256 QAM with a single tuner, two 1394, component and DVI 1.0 included, initially available at Best Buy, 720p/1080i, also by Cox cable, simultaneous HD with 480i for VCR, shows guide while smaller scaled window of current program could still show small letters, zoom and stretch functions from unit and remote. Sale version of the 3250D.

Explorer 8000HD Home Entertainment Center

Initially sold directly to cable operators, later available to retail distribution, dual 1394, PVR with several HDD options, DVI, component out, RGB adapter, selectable video resolution, optical digital audio out, USB port, AR control, in June 03 the unit was being

tested by Cox, 1394 initially one way only, a firmware needs to be delivered to activate the STBs that have 1394 connections, voice over IP cable modem to facilitate voice/data/video.

Explorer 8300 TTM 3Q04, Multi-room system, mock-up shown at CES 2004, built upon the 8000HD model, PVR with USB for external additions of HDDs, up to 3 client STBs could be connected coaxially to this server, the clients could also be any older cable STB that the company could recycle back as a slave unit of the server (like the model 2100), each client could control one independent DVR session, and watch a different program with full forward, pause, etc. controls.

Sony

SAT-HD300 $700 (down to $570 Oct 03), TTM Oct 03

ATSC and DirecTV tuners, simultaneous output of HD signals in HD and SD, DVI/HDCP, component, RGB via VGA, reported resets/reboots, sound dropouts, freezes

(New technologies announced Jun 03)
HD Cable STBs with "Passage-enabled" technology designed to work with open cable systems to equipment based on multiple conditional access technologies

DHG 25 "value" cable-box, with and without a DVR, outputs SD and HD
DHG 55 and 55/DVR group of cable HD-STBs, with DOCSIS cable modem, reportedly as "extremely interactive" on-screen program guides, optional 1394/DTCP, DVI/HDCP, DHG 55/DVR to be offered w/variety of HDD options

New Cable HD-STBs announced at CES 2004

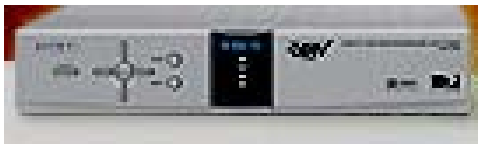
Sylvania

SRZ3000 $350, TTM current, also known as 6900DTD

ATSC/NTSC tuners, component, coaxial digital audio out, selectable 480i/p/1080i output

Toshiba

DST-3100 $600, original TTM March 03 (and is still not out by Feb 04, delay now apparently affected by DirecTV's take over of STB distribution in Jan 04, although Toshiba's website still say "coming soon")



DVI/HDCP, NO 1394, DirecTV/ATSC tuners, output select 480i/p, 720p, 1080i, plus hybrid automatic conversion to 480p or 1080i, simultaneous HD component out w/s-video,

optical Dolby Digital out, IR/RF remote, component, multi satellite inputs (2), advanced program guide.

V, Inc
Bravo HD1 $350, TTM Feb 04, ATSC/NTSC tuners, scale to 480p/720p/1080i over component output, component, digital audio coax, titanium finish, NO DVI, NO 1394, NO VGA 15 D-sub outputs, aspect ratio control (4:3, 1:6 letterbox, 16:9 full), simultaneous SD and HD outputs

VOOM HD-STBs (made by Motorola)
Model 550 $750, TTM current, includes ATSC antenna and dish, and complete installation
Supplying a new card for MPEG-4, free, would do the upgrade path from MPEG-2, rather than as reported on one of the industry magazines recently (by firmware upgrade only).
According to VOOM, the firmware upgrade has already happened. The 550 will NOT have a 1394 upgrade.

Model 580 DVR server and low-cost small clients

$TBA (estimated as $1,000 for the server, $50 for SD clients, and $100 for HD clients), TTM mid 04.
Network uses RF coax existing in the house; clients (or existing Voom HD-STBs like the 550) can control different sessions of tuning and DVR recording (up to 4 using 2 ATSC/2 VOOM tuners in the server) on the server on the network, there could be a combination of SD and HD clients, and the network supports multiple HDD DVR servers and additional external storage devices.

Functionality includes: pause, rewind, fast forward, instant replay, jump, and slow motion on/from every VOOM-enabled TV in the network, a client could move or send any SD or HD live or prerecorded program to any VOOM-enabled TV in the network, move a program to any room at any point during the program and then resume watching the program starting from the exact scene they left it.

VOOM is considering an upgrade path from the 550 model (probably a replacement by paying a difference) as a respect to the investment made by their early-adopter costumers (no details provided yet). The 580 will have dual 1394 to facilitate external HD D-VHS recording, it would also work with MPEG-4 when VOOM switches to that standard.

The clients prototyped at the demo did show connections for S-Video, Ethernet 10/100, Firewire 1394 6-pin, optical digital audio out, composite/L/R; they did not have the coax RF but VOOM said that RF will be the final connection for the network when the unit is released.

Each small client would be able to control a DVR session independently regardless where the 580 is located in the network, and also each small client would be able to take the HD compressed signal out via the 1394 6-pin connector for D-VHS archival, or future HD-DVD recording.

The existence of DVI/HDCP outputs could not yet be confirmed on the prototypes. The client STB has the size of two cigarette boxes side-by-side.

Zenith/LG

No 1394 on any of the models except on LG-LST-3410A (although originally its Zenith's version HD-PVR330 did not have 1394 when announced)

LG LSS-3200A (previously announced as Zenith HD-SAT530)

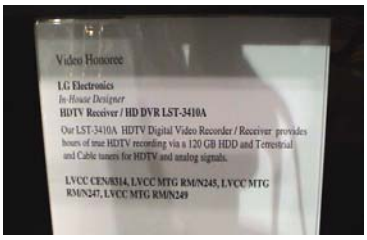
$700, TTM Sep 03 (in Sep 03 the TTM was moved again to Nov 03), 3rd generation STB, ATSC/DirecTV, Native 720p, simultaneous HD and 480i outputs, DVI/HDCP, aligned to replace the HD-SAT520 (which also was released with DVI), selectable output 1080i/720/480p/480i with pass-through, component, RGB, DVI/HDCP (output switch on back), NTSC tuner with line doubler, NO 1394

HPD-220 $N/A, TTM N/A, ATSC tuner and controller for Plasmas, simultaneous HD and 480i outputs, RGBHV, 2 component, DVI, selectable 1080i, 720p, 480p

HDR230 $1,000, TTM 2Q03,

ATSC, PVR 80 GB, 8 hrs HD recording, electronic program guide, DD recording, VBR, live pause, RGB, component, NO DVI, NO 1394

LG LST-3410A



(Previously announced as Zenith HD-PVR330), $1000, TTM Feb 04 (originally Nov 03), ATSC, QAM tuners, PVR 120GB, 8 hrs HD recording, DD recording, DVI/HDCP, RGB, component, 1394 2way, GemStar EPG, No CableCARD for scrambled cable channels

LG LST-3510A (previously announced as Zenith HDX330), $500, TTM 4Q03, ATSC/QAM/NTSC tuners, DVD player, 3:2 pull-down, 5.1 DD audio, simultaneous HD and SD outputs, DVI/HDCP, RGB, component, DVD upconversion to 1080i over DVI, selectable 1080i, 720p, 480i/p outputs, line-doubler. Originally excluded 1394 (when from Zenith), LG version excluded 1394 as well.

LG LST-3100A (previously announced as Zenith HDV430), $400, TTM 4Q03, ATSC/QAM cable tuners, simultaneous HD and SD outputs, 5.1 DD audio, selectable 1080i, 720p, 480p, 480i and native output resolutions, DVI/HDCP, RGB, component, this STB is an update of the HDV-420. The unit originally excluded 1394 (when from Zenith), LG version excluded 1394 as well.

No other HD-STBs announced for 2004 at CES.

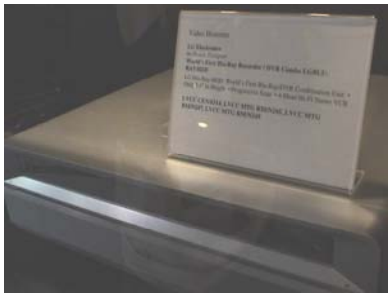
HD Recording

HD DVD Players/Recorders

EVD (Enhanced Versatile Disc)
Chinese HD player DVD format (details on the General Review included below)

LG
Displayed a pair of Blu-ray HD optical disk recorders, available in September 2004

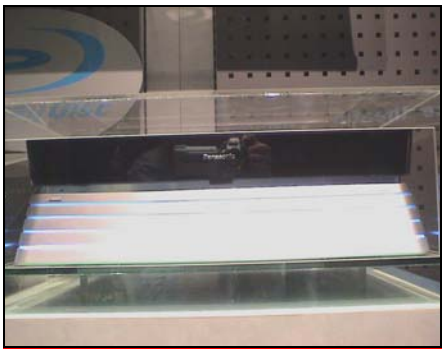
A) One with built-in ATSC tuner
B) Another unit (LGBBLU-RAYHDD)



With HDD VDR 160GB, $ TBA (estimated to be at $2000), VHS VCR combo, world's first Blu-ray recorder.

LG has put an emphasis on receiving and recording (also evident on their new 60-inch HDTV with built-in DVR), 1394, ATSC/NTSC tuners, Gemstar TV guide, does not record regular DVD, blue and red lasers, HDMI, component out.

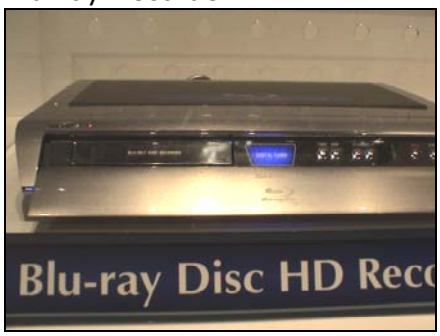
Panasonic
Blu-ray Recorder

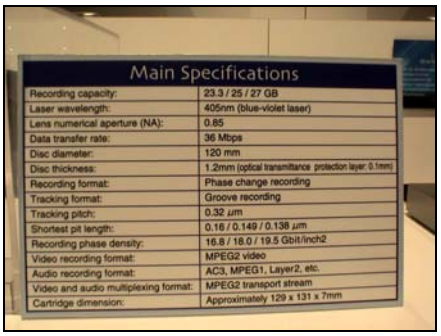


Pioneer
Displayed a Blu-ray recorder, $TBA, TTM N/A (Pioneer declared "no rush" on releasing it)

Samsung
BD-R1000 Blu-ray, $2,000 (estimate), TTM mid 04, ATSC/NTSC tuners, HDMI, component out, digital audio coax/optical, selectable outputs switchable to 1080i/720p/480p, S-Video in/out.

Sharp
Blu-ray Recorder





Sony
CES 2004 Blu-ray demo

Player only, BD-DVD, TTM N/A, $N/A, only component out, plays pre-recorded media without a caddy. Current Blu-ray recorder in Japan will eventually be capable to play caddy-less pre-recorded media. The weight of a caddy w/Blue-ray DVD is similar to a regular CD/w jewel box.

Their Blu-ray DVD demo was displayed with a Qualia 004 with behind screen projection; the room lighting and general setup was not appropriate to properly evaluate image quality.

CES 2003 Blu-ray demo (as reported a year ago)

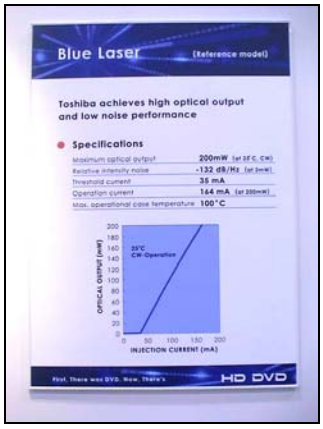
Sony demo their Blue-ray prototype. With DVI, 1394 has not been agreed yet (is up to the alliance to agreed such feature, an it has not been decided yet), TTM in 2-3 years (1 year in Japan), estimated MSRP $3,000 (at that time). Then, on March 11, Model BDZ-S77 was introduced, with satellite tuner, 2 hrs HD on a single DVD, $3,800, starting in Japan on April 03, disks at $30 with 23 GB of data, will read DVD, DVD-R and DVD-RW (will not RAM and +RW)

According to the (Mar. 10, 2003) Electronic Engineering Times:
Sony's system can record HD programs for two to three hours in a "direct-record" mode, using the MPEG2 Transport Stream format and the MPEG 2AAC format at a maximum rate of 24 Mbits/ second. Two MPEG image processors encode and decode standard-definition analog TV programs in three modes: high resolution at a 16-Mbit/s fixed data rate; standard resolution at a variable rate that averages 8 Mbits/s; and a low-resolution rate that averages 4 Mbits/s. The recorder's copy-protection system only allows the recording of programs with "free copy" or "copy once" codes. Most TV shows in Japan specify "copy once," said a spokesperson for NHK, adding that with the advent of home servers, the issue is "under review for better protection." Sony's first Blu-ray Disc recorder, which goes on sale April 10 in Japan, will record high-definition TV but not movies or sporting events.

Toshiba
HD-DVD format (previously known as AOD), two units at the show:

- Player with HD-DVD blue laser and DVD red laser
- Recorder of HD-DVD only, will have ATSC tuner, the final product could have the following modules to encode/decode: MPEG2, 264 or MPEG-4 (not decided yet). According to Toshiba they view the 264 standard as better for them (it obtains up to 50% improvement in compression compared to MPEG-2), while MPEG-4 is more complicated to license.

Player **Recorder**



WMV HD
HD format for DVD developed by Microsoft

720p and 1080i. Windows XP compatible with Windows Media Player 9 Series. Big Picture, Ascent Media, Artisan, Europa, and MPO produce HD DVDs.

720p discs require 2.4 GHz processor, 384 MB RAM, 64 MB video-card, DVD-ROM drive, 1024x768 screen resolution, 16 bit sound card.

1080p discs require 3GHz processor, 512 MB RAM, 128 MB video card, 1920x1440 screen resolution, DirectX 9, DVD-ROM drive, 24-bit 96-KHz multichannel sound card, 5.1 surround sound speaker system.

V, Inc.'s announced their new Bravo D3 home HD DVD Media Player with Windows Media 9 video compression CODEC. The Bravo D3 can playback HD content recorded in WM9 on standard DVDs. It outputs 480p/720p/1080i through component video and DVI-HDCP. TTM 2Q04, $350.

The unit also includes Microsoft/Matsushita-developed HighMAT format for media-file aggregation and playback management, and is powered by a Sigma Designs EM8620L processor. It can also decode MPEG-2, MPEG-4, WMA Pro, WMA lossless, Dolby Digital, MP3, MPEG-1/-2, and MPEG-4 AAC audio files.

According to V, Inc., WM9 HD content can be downloaded from supporting web sites (such as BWMfilms.com, CinemaNow, IFilm and Movielink); a user can record it on a regular DVD (using a PC) and play it on the Bravo D3. With the help of Microsoft's Windows Movie Maker 2 software, home movies could also be made and played back on the D3.

HD DVD Formats, General Review

In November 2003, after a first defeat a few months earlier, Toshiba and NEC announced that the DVD-Forum approved their "read-only" format, called HD-DVD. The companies still need similar approval for "rewritable" DVD recorders, a step the companies say they hope to get soon.

The format claims that prices could be 20 percent lower than Blu-ray because the assembly lines for current DVDs can be adapted to make the next-generation discs (that, was said, cannot be done for Blu-ray discs).

The HD-DVD format has been designed to maintain maximum compatibility with current DVD discs and hardware (player, recordable, and rewritable). The discs (prerecorded or possibly rewritable media) will not require protection caddies.

A DVD-Forum official said both companies are not ready to sell their products on the market yet, they are looking into the availability of HD content, such as movies and entertainment material.

Both companies said they plan to design products with the new technology. NEC plans to launch new models of personal computers with the technology in the fall of 2005.

Toshiba hopes to launch in 2005, and have plans to sell notebook computers with HD DVD drives in the future, and plans to start marketing an HD DVD recorder sometime next year.

On looking at the background of the approval itself, it was declared by Toshiba/NEC that the AOD proposal submitted originally was not actually "rejected", it was just "not approved due to no vote" of some Steering Committee Members of the DVD-Forum. The win at the last vote was helped when the abstentions did not count (supported by about 200 electronic/media companies members of the committee).

During this approval process, it was commented that the derailing of the Toshiba/NEC proposal for HD-DVD did not mean that the DVD-Forum would dissolve. A two-year election for new members was planned for October 03.

AOD (now HD-DVD) recorders will also record current laser format as well as the blue laser format. The encryption system would be called AES (Advanced Encryption Standard). AOD will support 1080p/24 studio releases. Peak rate of AOD 36.55 Mbps.

It is hoped that DTS multi-channel audio format will be included, and likely to include DVD-Audio as well. Toshiba wants to complete everything by mid 2004, and prepare the product by 2005.

Knowing that Blu-ray, HD-DVD, WMV HD (Microsoft) and EVD (Enhanced Versatile Disc, Chinese version of a HD DVD player format, more of it later) are all pursuing a competitive place in the market, it could possibly mean another format war, but both formats HD-DVD and Blue-ray are now competing for the pre-recorded (play-back) format, which would require Hollywood's support, known to favor only one format.

Additionally, Hollywood's good current business of regular DVD might add further delays to the process (considering that a HD version of DVD could impact such DVD business).

Media companies are interested on pre-recorded not recordable formats. It is known that Sony and Matsushita are needed for the support of the HD-DVD format for it to be successful (as it happened with regular DVD).

The computer industry has also to choose a format for the development of a large mass of HD hard drives. NEC decided to partner with Toshiba on their HD-DVD format, and at CES Dell and HP have partnered with the Blu-Ray format alliance.

As mentioned above, the Chinese DVD video industry has just released their format called EVD and about 20 million players could be expected in the market in the next couple of years. EVD chips are being produced and the format is expected to be an enhancement of the current DVD format.

The format could certainly affect much more than the Chinese market. It is believed that content providers have not been contacted yet, an important factor for a pre-recorded format to be successful.

To actually get a feeling of how real is this new Chinese DVD for HD (EVD) player, I met at CES with representatives of the Chinese company that manufactures the finished product, Changhong, Sichuan, China.

According to the company's profile (summarized version) "Changhong Electric Co., Ltd was founded in 1958, their R&D teams have joint labs with Toshiba, SANYO, Philips, Panasonic, Motorola, to name a few. Changhong was regarded as a miracle in China, it grew to be one of the 3 leading TV manufacturers in the world, the aggressive DVD product supplier in China, the biggest electronics component supplier in Asia, with sale's volumes over 2 billion US dollars".

They are looking for US importers of the EVD player at this time. I have a pending confirmation of the information below with the US project manager, but the following is what it was disclosed at my CES meeting. First, it was shocking to know that for their internal market the EVD player sells for approximately $120 (no zeros missing).

Those that have followed past and recent events regarding DVD for HD (I am using that term to avoid confusing it with the HD-DVD named by Toshiba), will notice the large price difference with Sony's Blu-ray product released in Japan in April 03, which, although it is a recorder unit w/satellite tuner in Blu-Ray format, it sells for $3,800 (or over 30 times the EVD).

Likewise, other Blu-ray (unreleased) player products shown at CES (for the last 3 years) are generally estimated by their manufacturers at price points around $2,000 when introduced by 2004/5.

This Chinese EVD manufacturer company expects that the product could sell in the US market for about $250, with a listed importer cost of $80 per unit ($ from the exporter list shown at the meeting).

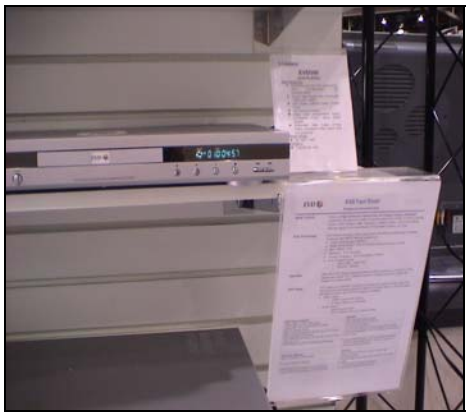
This brings the hope that the low price pressure introduced by EVD could make more affordable this technology sooner than experienced on previous format wars, such as the recordable DVD, DVD-Audio and SACD, and even the old Beta vs. VHS.

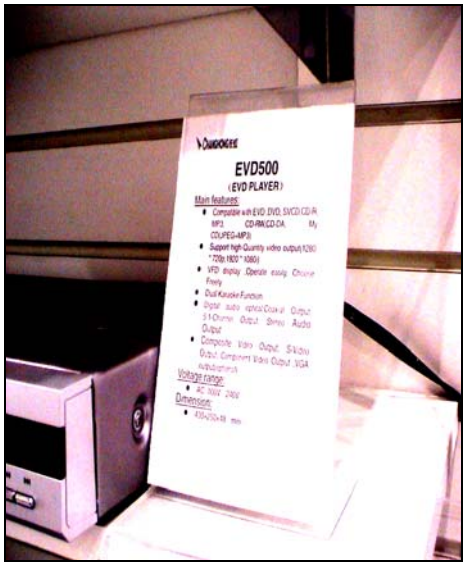
Regardless of what the actual outcome of the EVD pricing would be, the pre-recorded playing format could only compete (and make pressure on the market) as long as the hardware and software are of "uncompromissed HD quality and storage capacity" and the major Hollywood content providers support it.

One particular item that I am waiting for clarification is the storage capacity declared on the last two lines of the EVD Fact Sheet included below (>105 minutes for 720p, >50 minutes for 1080i). As of this final, the EVD company has not returned messages to confirm pricing and specs; therefore, the information is provided as supplied at their CES booth.

In the year 2004, we will witness how this format competition evolves and which one/s the Hollywood content providers would actually support; some of these manufacturers have already announced that they would release their HD DVD products starting this year.

The following are some photographs of the released EVD player and its specifications:





EVD Fact Sheet

Enhanced Versatile Disc

WHAT IS EVD

EVD is a **High Definition Optical Disc and Player Industry Standard** created by an alliance of major consumer electronics OEMs in China including Shinco, SVA, Nintaus, BBK, Amoisonic, Malata, Konka, CETC and others with the support from the Ministry of Information Industry in China.

EVD Technology

EVD Player and Disc utilize mature and cost effective technology to enable consumer with **HDTV** viewing experience:

- Video Compression : MPEG II
- Audio Compression : EAC 6 Channel Surround Sound, LPCM
- Mux : MPEG II PS
- Navigator : EVD Navigator
- Content Protection : EVD Proprietary Scheme
- EVD Content Format
  - 1920x1080i, 1280x720p
  - 720x576, 704x480

EVD Disc

Both HD or SD Digital Audio and Video content is stored on a DVD5 or DVD9 optical disc media. EVD Content Protection Scheme is used to protect the interest of content owner.

EVD Player

EVD player is a machine composes of optical disc playback loader and EVD decoding and processing engine. It reads HD content stored on the EVD disc and plays it back to any HDTV or regular TV display.

- Video Output
  - YPbPr Output (HD Output)
  - S-Video Output or Composite
- Audio Output
  - Stereo Audio Output
  - EAC 6-Channel Surround Sound Output

EVD Player Features	Benefits
1920x1080i or1280x 720p Video	High Definition Video quality
1920x1080 50i or 1920x1080 60i display	Supports both PAL or NTSC TV
EAC 6-Channel Audio	Surround Sound effect
Motion Compensated De-interlacing Up Conversion	Convert SD content into HD, enhance video quality
HD to SD Down Conversion	Backward compatible to all TV available in the market
High Definition Resolution On-Screen Display (OSD) + Interactive GUI	Ease of use
JPEG Photos and MP3 Simultaneous Playback	Display High Resolution JPEG photographs together with your favorite MP3 music. Enable consumers to create personal HD Albums

EVD Disc Features	Benefits
Base on DVD5 or DVD9 Media	High volume and low cost media to store High Definition content
Content Protection Scheme	Prevent illegal use of HD content stored on the optical media
1280x720p format storage on one DVD9 disc	≥ 105 minutes Audio/Video Storage
1920x1080i format storage on one DVD9 disc	≥ 50 minutes Audio/Video Storage

HD D-VHS Recorders

JVC

HM-HD40000U $800, TTM June 2003, D-Theater compliant

Component out, auto HD/STD mode for easy recording, new LS5 mode for up to 35 hrs recording at about 480i digital quality (better than SP on VHS), 1394, NO DVI, NO RGB outputs, NO ATSC tuner.

Specifications update sourced on recent tests of the product:

480i/p, 720p, 1080i output on component out, conversion of 720p to 1080i via menu, down-conversion to 480i is made available on S-video and composite outputs only when the component output is also down-converted, i.Link in back panel is bi-directional for MPEG video, digital audio and device control signals between compatible products, optical digital audio out for DD, 2-CH PCM and "Stream" for future formats (such as DTS eventually added to D-Theater releases).

Records D-VHS at four input bit-rates: 28.2 Mbps (HS), 14.1 Mbps (STD, 5hrs-7hrs), 4.7 Mbps (LS3, 15hrs-21hrs), and 2.8 Mbps (LS5, 25hrs-35 hrs). D-VHS recordings made can be exchanged with other D-VHS recorders, two sizes of cassette available: DF-300 (31.7 GB 2.5 hrs at HS, $15 MSRP) and DF-420 (44.4 GB 3.5 hrs at HS, $25 MSRP), the DF is # of minutes in the STD mode.

No component input. DV video from cameras via the 1394 is converted to MPEG-2 for recording, with some picture degradation. Recordings made with the new HD camera GR-HD1 in 720p and 480p can be transferred via the 1394 without conversions, it will not output digital video in the DV format, but in MPEG-2 video version on its 1394 output.

HD recordings of OTA do not playback status-display information via the 1394 (although they show on the Samsung 165 on-screen 1394 control panel). It has an MPEG-2 encoder to make digital recordings of analog content in any of the four speeds; two-channel analog audio is also converted (and playback) to digital 48 kHz PCM format using a D-VHS cassette as requirement.

Digital recording of copy-protected sources (such as DVD) is not possible. It does not have scan forward/reverse at variable rates in HD (only at 6x in HS, 12x in STD, 36x in LS3, and 60x in LS5 mode), neither slow motion/single steps by frames, pause jumps 3 seconds forward on digitally recorded tapes. A DFC-2 D-VHS head cleaner cassette comes with the recorder (regular head cleaner cassettes can damage the D-VHS heads).

Video navigation functions to locate chapters take about 90 seconds to get to a place at the tape that is 60 minutes away, and a little more to rewind back. Navigation menus graphics show as 480i over component (which temporarily switches back to do that), the same occurs when the 1080i tape is stopped, causing inconvenience to HD projectors that can not display 480i on their HDTV inputs, because in order to view the menu it has to be switched to an alternative S-video input.

Navigation data is stored on the recorder not on the tape, which means the tape does not need to be mounted to search the personal library, or to find blank spaces. The data cannot be transferred to another recorder (loading each tape once will). Lack of DVI output could be offset by the 1394 to the Samsung 165 and using the DVI from the Samsung, based on the standard of

1550 pixels/picture width for a flat response to 30MHz the recorder only delivered 1035 pixels/pw for 20 MHz at 1080i (1dB better than its predecessor) via its component output. It is better to use the Samsung 165 STB DVI output to the TV as a channel from the 1394 connection from this recorder, rather than the analog component conversion output.

(Announced at CES 2004)

JVC has shown at CES a new pair of D-VHS HD-VCR tape recorders to be available later in 2004, these are the HM-DH5U and the HM-DT100U (this model with a ATSC tuner included), they both are D-Theater compliant, have MPEG-2 decoder, 5.1 Dolby Digital playback, HDMI and component video outputs, and can play/record VHS-S-VHS-ET in addition to the digital formats. Price was not made available yet.

JVC indicated that early in 2004 they will make announcements related to D-VHS products, no specifics were given, although they might be along the lines of the above disclosure at their CES booth.

(Updated Mar 03)

Marantz

MV8300 $1,600, TTM 1Q03, D-Theater, and S-VHS, partner with JVC, 1394 connections, compression option to fit more content on tape, 2 DVi inputs for camcorders signals, 2x s-VHS inputs component out, optical audio out, for DD 5.1 and PCM, VCR+Plus recording.

Other D-VHS current units from Mitsubishi and JVC are included on the CES 2003 report.

Digital Connectivity (DVI, 1394, HDMI)

DVI

The DVI (Digital Visual Interface) 1.0 specification was introduced in April 1999 by the Digital Display Working Group integrated by Silicon Image, Intel, Compaq, Fujitsu, Hewlett-Packard, IBM and NEC for the purpose of creating an digital connection interface between a PC and a display device. It is a connection with enough bandwidth for uncompressed HD signals.

The 1.0 DVI specification is a point-to-point solution that supports video content but not audio. DVI uses the Transition-Minimized Differential Signaling (TMDS) protocol developed by Silicon Image. PanelLink is the Silicon Image's proprietary implementation of TMDS.

The HDCP (High-bandwidth Digital Content Protection) 1.0 specification was developed by Intel with contributions from Silicon Image in February 2000 to protect DVI outputs from being copied by providing a secure link between a video source and a display device.

HDCP offers authentication, encryption, and renewability. The Motion Pictures Association (MPA) endorsed HDCP as the standard for the secure transmission of HD signals over DVI.

Most new DTV monitors and integrated displays have incorporated DVI inputs, although some panels might not HDCP compliant.

According to Noel Lee (Monster Cable), owners of HDTVs with no DVI connections would have available a "Legacy box" converter, but the resolution would be limited to 480i as it converts from DVI to analog. However, connecting a DVI-D source/plug to a VGA analog input monitor requires a digital to analog converting adapter, which currently cost around $400.

The DVI standard is able to handle single or dual link connections. A single-link connection supports up to UXGA resolution of 1600 x 1200 at 60 Hz. Dual-link connections provide bandwidth for resolutions beyond QXGA (2048 x 1536).

Each link has three data channels for RGB information with a maximum bandwidth of 165 MHz, which is equal to 165 million pixels per second. Dual-link connections have the double of that capacity. Single link has a speed-rate capacity up to 4.9 Gbps, double link 9.9 Gbps.

DVI identifies and auto-configures the connected device. If source equipment is connected with DVI single link to a display configured as double link DVI, the image will experience a lower resolution. Some first generation single link DVI cables use double link connectors. DVI standard cables have typically a five-meter distance limitation, although with better quality wiring, such as fiber-optic, higher distances are possible.

There are three types of DVI connectors:

DVI-I (integrated), carries a single or double-link digital signal, with an additional analog signal for legacy devices. The 29-pin DVI connector uses 24 pins for the digital data stream (12 for each link) and 5 pins (1 plus -shaped blade and 4 pins) to carry analog audio/video and ground.

DVI-I

DVI-D (digital) carries digital-only video data to a display. It is designed for 12 or 24 pin connections, and single/double link operation (notice the lack of 4 pins, 2 above/2 below the flat blade).

DVI-D

DVI-A (analog) is available for legacy analog applications to carry analog signals to a CRT monitor or an analog HDTV (claims to be better than VGA). The three rows of eight pins have three pins missing in the first row, five missing in the second row and four missing in the third row, and that the "flat blade" contact seen to the left has two contacts above and below it. There is no single or dual link in analog cables.

DVI-A

Regarding connecting plugs to receptacles:
A DVI-D plug can be connected to either DVI-D or DVI-I receptacles,
A DVI-A plug can be connected to either DVI-I or VGA receptacles,
A DVI-A receptacle would accept DVI-I but not DVI-D.
A DVI-I plug can be connected to either DVI-I or DVI-A receptacles (the 'A' ignores 'I's digital pins)

1394

1394 is the short for IEEE1394, is a digital interface conceived by Apple Computer in 1986, and it was called "Fire Wire" for its fast speed of operation. In 1995, the Institute of Electrical and Electronic Engineers (IEEE) adopted the serial bus as its standard 1394. Sony trademarked their name iLink for their implementation of the 1394 bus as a 4-pin connector.

In March 2000 an updated specification was approved, the 1394a. The "a" standard supports speeds of 100Mbps, 200Mbps, and 400Mbps over a distance of 4.5 meters, and up to 63 peer-to-peer nodes/devices.

In 2001, the IEEE 1394 "b" standard emerged as a network technology (rather than as serial bus); it is capable of moving data streams at faster speeds over longer distances than the original.

The "b" standard can support up to 3,200 Mbps depending on the cable material, and supports cabling materials not supported by the "a" standard. It supports speeds up to 100Mbps over 100 meters of Category 5 wiring, 400 Mbps over 100 meters of plastic optical fiber, and up to 3,200 Mbps (or 3.2 Gbps) over 100 meters of glass optical fiber.

The "b" standard is compatible with the "a" standard; if an "a" device were plugged into a "b" component, the bus would deliver a maximum speed limited by the "a" standard (400Mbps). Each "b" device can be set up to 100 meters apart from the next in sequence, allowing the total network to be quite significant in cable length.

The licensing fee for the use of the patented technology is $ 0.25 per system; chipsets are less than $5 each in volume.

It supports hot swapping and plug-and-play, so a consumer's 1394 bus can recognize automatically a 1394 device when it is connected/disconnected, and reconfigure itself.

The connection is now being used by a growing number of DTV equipment manufacturers for the transmission of compressed HD signals, such as D-VHS recording and networking DTV equipment.

There are three types of cables used for 1394. The 6-conductor type has two separately shielded twisted pairs for data and two power wires in an overall shielded cable with 6-pin connectors on either side. The 4-wire cable uses two separately shielded data cables without power wires in an overall shielded cable with 4-pin connectors on either end. The third type of cable uses either type of actual cable, with a 6-pin connector on one side, and a 4-pin connector on the other side of the cable.

The 4-pin connector is more common on digital video camcorders and other small external devices because of it's small size, while the 6-pin connector is more common on PC's, external hard drives due to it's durability and support for external power for 1394 peripherals.

6-pin female connector on left.
4-pin female connector on the right

The 6-pin male connector

4-pin male connector

HD signals are broadcast in compressed MPEG-2 format at approximately 19 Mbps. D-VHS VCRs are able record compressed HD signals and require a 1394 connection to receive the digital data stream. HDTV monitors require a MPEG-2 decoder to decompress the signal for display, as oppose to DVI that is uncompressed.

DTCP (Digital Transmission Content Protection) has been created for the purpose of copy protection over the 1394 connection. DTCP is also known as 5c for the five companies that participated on the standard (Sony, Toshiba, Intel, Hitachi, and Matsushita).

During the last two to three years, there have been many discussions (and hype) about using these types of digital connections (DVI and 1394) for DTV equipment, rather than only the analog connections (component YPbPr, RGB, RGBHV, etc), for protecting HD digital content.

During 2003, most manufacturers released a large variety of products adopting these two connections to enable their equipment for digital connectivity.

However, HDMI in the horizon to replace DVI, and is being implemented already on several products.

HDMI

On December 9, 2002, the seven founders of HDMI (High Definition Multimedia Interface) announced the 1.0 specification of this connectivity standard, the enhanced, more robust form of DVI. The seven founders are Hitachi, Matsushita, Philips, Silicon Image, Sony, Thompson, and Toshiba.

The standard supports HD uncompressed video, 8-channel digital audio (reportedly up to 192 KHz), and some control signals on a single wire (15 mm, 19 pin), and still have some bandwidth available.

HDMI has capacity for up five Gbps of bandwidth, double of what a HD signal would require.
HDMI claims to be backward compatible with DVI by using an adapter.

Not included in the standard but used with HDMI is the HDCP (High-bandwidth Digital Content Protection) protocol. HDCP is licensed by Intel, designed to protect HDMI and DVI signals from piracy, and used for authentication between A/V products.

It is expected that after the specifications are issued manufacturers would be in a position to incorporate HDMI silicon chips in their next-generation of DTV products (possibly by the end of 2003, or 2004). A license fee of five cents is applied to each product (four cents for HDMI, 1 cent for HDCP), that the manufacturer is to pay to the HDMI founders and Intel.

(Announced Sep 03 CEDIA)
A Sample of Some New products with HDMI

Panasonic LCD displays (2): TC-32LH1 (32-inch) and TC-22LH1 (22-inch)
Panasonic RPTVs
Pioneer Elite DVD Player: DV-59AVi $1,600, 480p, 720p, 1080i conversion selectable, replaces the 47Ai
Pioneer PureVision plasma TVs (4): PRO-1110HD (50-inch), PRO-910HD (43-inch), PDP-5040HD (50-inch), and PDP-4340HD (43-inch)
Pioneer Elite projection TVs (2): PRO-730HDi (64-inch) and PRO-530HDi (53-inch)
Pioneer Elite PureVision plasma monitors (2): PRO-1000HDI (50-inch) and PRO-800HDI (43-inch)
Sony projectors (3): VPL-HS3, VPL-HS20, and Qualia 004
Meridian DVD-A transport: G98
Meridian DVD-A controller: G91DH
Meridian DVD-A player: 800
SIM2 Grand Cinema projector: HT300 LINK
Krell pre/pro and DVD player ($3,500) with 480p/720p output, $750 extra to able the HDMI when the specs are finalized.

A good number of new HDMI able products are included on the HDTV sections earlier on the report.

HDMI Multi-connectivity Update from CES 2004

Silicon Image:

Introduced three HDMI PanelLink Cinema ICs for more features, lower cost per port, DVD-Audio support, higher video resolutions, more sampling frequencies, more HDMI ports, etc:

Sil 9030 transmitter, targeted at the DVD-Audio players/recorders and receivers, supports D-Audio at 32-192kHz frequencies, backward compatible with Sil 9190 1st generation transmitter, 25-112 MHz video bandwidth, compliant w/CEA-861B and HDCP1.1, will support digital audio through S/PDIF digital audio interface, will support Plasma/LCD w/1024 lines (SXGA)

Sil 9021 receiver, dual HDMI inputs, designed for DTVs, backward compatible with first-generation Sil 9993 receiver chip, compatible with CEA-861B and HDCP 1.1, 25-112 MHz video support for Plasma/LCD w/1024 lines (SXGA)

Sil 9031 receiver, targeted at Home-theater receivers, DVD-Audio support, sample frequencies of 32-192kHz, dual HDMI inputs, backward compatible w/Sil 9993 first-generation receiver, HDMI 1.0 compatible, CEA-861B and HDCP 1.1 compatible, 32-112 MHz video bandwidth for support of Plasma/LCD 1024 lines of resolution, support of compressed digital audio through S/PDIF interface

Integra
DTR 10.5 receiver ($3,500) with card-based architecture customized by dealers; Net-Tune Ethernet connectivity, includes Firewire 1394 connection to Integra universal DVD player for DVD-Audio and SACD in the digital domain. Optional card for HDMI input. Most cards will be $100/$200. TTM Apr 04.

Integra Research
RDC-7.1 preamp/processor ($4,000 base price, $5,500 w/all optional cards), NetTune Ethernet connectivity, Firewire 1394 to connect digitally from DVD-Audio and SACD players, all video inputs up converted to 480p via HDMI output, two HDMI inputs/one HDMI output in optional HDMI module, TTM Apr 04

Onkyo
TX-NR1000 receiver ($4,000), NetTune Ethernet connectivity, also card design, will ship with more cards as standard equipment than the Integra models above

Other manufacturers (mostly DTV displays) are beginning to incorporate HDMI connections on their products, some replacing their DVI versions, some others jumping into HDMI directly, most with single connections, no switching, as with DVI.

A year ago at CES 2003, only Panasonic announced an HDTV with CableCARD QAM tuner and HDMI connectivity, a product that actually was released by the end of 2003. A year later it is evident the gradual movement to HDMI, but still very slow.

DVD players with 720p/1080i upconversion

Icon-TV
Car DVD-player $700, TTM Feb 04, up converts to 720p/1080i, will ship with the HDTV car monitor capable of 1080i (10.5 inches, $2,000). Lexus and BMW would carry them. They have another 15.3 HD overhead screen available now (1280x768) for $1,900 ($2,400 w/built in DVD player).

Integra
DSP-10.5 $2,500, TTM Apr 04, DVD-Audio/SACD w/HDMI upconversion of DVD video to 720p/1080i, Firewire 1394 output, video switching and converter of analog inputs to HDMI output (but without upconversion to 720p/1080i of those).

Integra Research
RDV-1.1 $4,000, TTM Apr 04, universal player, same features of DSP-10.5 above, adds AES/EBU digital output for using the player as a CD transport.

Klipsch
HTiB w/universal player $4,000, TTM May 04, transcoder to up convert analog inputs to component (and down convert component to S-Video/composite), up converts video to 1080i and performs HD video switching

LG
LST-3510A $500, TTM 4Q03, DVD player with DVI/HDCP and component, selectable 480p, 720p, 1080i outputs, includes ATSC/QAM and NTSC tuners (see HD-STB section), upconversion via DVI.

Onkyo
DV-SP1000 $2,000, universal player, HDMI, up converts to 720p/1080i over HDMI, omits the analog video inputs of Integra models.

Philips
DVDR755 $N/A, TTM N/A, DVD player w/1080i upconversion out (only thru HDMI connection), HDMI/HDCP, PCMCIA Media slot to view photos

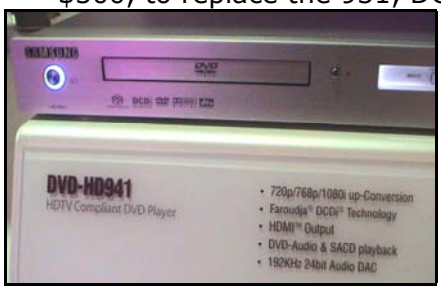
Pioneer
DV-59AVi Elite $1,600, 480p, 720p, 1080i conversion selectable, replaces the 47Ai

Samsung
DVD-HD931 $300, TTM current (included on the CES 2003 report as innovations), 1080i/720p upconversion only over DVI, component outs for 480p

The following two future players from the new Samsung 41 line will up convert to a selectable format 720p/768p/1080i, play SACD and DVD-Audio, 192Khz/24bit audio DACs, TMM 3Q04

DVD-HD841 $200, DVI

DVD-HD941 $300, to replace the 931, DCDi, HDMI, black level adj., discrete IR codes



DVD-2000 $1000, TTM Jun/Jul 04, DVI, DCDi, 720p/768/1080i upconversion (up scaled model)

V, Inc.

Bravo D1 $200, TTM current

The 1080i/720p upconversion is from DVI only. The published specifications of "Analog YPbPr video and digital DVI (Progressive or Interlaced) scalable up to 1920x1080i or 1280x720p resolutions" are not correct, the HD upconversion is not output on the analog component connection, according to the company the software of the unit displays a message indicating that such resolution is not available over the component connection.

This correction makes this unit with similar connectivity upconversion capabilities than its competitors.

Bravo D2 $250, TTM Feb 04, 480p/1080i/720p/custom scaling, MPEG-4 DVD/media player, enhanced with controls of brightness and contrast on DVI, enhanced DVD-ROM drive, improved analog video output, and a new remote control. Titanium finish.

Acronyms

The following list has been provided as a "brief" description of terms only to facilitate the reading of the report. Please refer to appropriate reference material for the exact definitions or descriptions.

1394: IEEE1394, also known as FireWire and iLink (Sony). Connectivity standard that is used for compressed MPEG-2 digital video, i.e., for D-VHS tape recording or for networking DTV devices.
5c: Copy-protection protocol used by the 1394 digital connection. Also known as DTCP. The name originates from the group of five companies that developed the standard.
AR: Aspect Ratio. Relationship between the horizontal and vertical axis of a TV or image. For example: 4:3 is 4 times wide by three times tall (also expressed as 1.33:1, our NTSC TV standard for over 50 years); 16:9 is 16 times wide by 9 times tall, also expressed as 1.78:1 (the HDTV standard within DTV). Another related specification, OAR, for "original", is commonly used to identify the AR used by the director in wide-screen movies.
ATSC: Advanced Television Systems Committee, for the new DTV digital television system.
BNC: plug for analog connections for DTV signals. Also, see RGB.
Component: Use on this report to describe a type of 3-wire analog HD connection. See YPbPr. Theoretically, RGB via VGA D-sub 15 pin, and BNC (both RGBHV type) are also component.
D/A: Digital to analog converter (the inverse conversion is also mentioned as A/D).
D-Sub: Name associated with the VGA connection with 15 pins for RGBHV signals.
D-VHS: Digital VHS VCR that records compressed HD digital signals on videotape.
DCDi: Directional Correctional De-interlacing. Faroudja's proprietary name for their de-interlacing chip used now in many products.
DNIe: Samsung's proprietary name for their new video enhancement technology "Digital Natural Image" enhancement.
DTCP: Digital Transmission Content Protection. See 5c.
DTV: Digital Television System.
DVDO: Scaler/De-interlacer product that converts 480i (NTSC images from broadcast, VHS or DVD) to 480p. Commonly utilized to bypass internal DTV line doublers when those are of unsatisfactory quality. Now up converts to 720p and 1080i as well.
DVi: Also known as iLink 1394 digital connection for digital video cameras.
DVI: Digital Visual Interface (connectivity standard for digital uncompressed HD video).
EDTV: Enhanced Digital Television. Not a DTV format standard as originally established. The term was created by the CEA in 2000 to help consumers in the transition to DTV. See [i]
HD1: Original Texas Instruments chip for DLP.
HD2: Upgraded Texas Instruments chip for DLP, also called "Mustang". + is the upgrade.
HDCP: High-bandwidth Digital Copy Protection protocol used by the DVI and HDMI digital connections
HDMI: High Definition Multimedia Interface, connectivity standard for the transmission of uncompressed HD video, some control signals, and multi-channel digital audio, all within the same cable. HDMI is the planned successor to DVI. Claims to be backward compatible with DVI with the use of an adapter. Utilization has started in some 2003 products.
HDTV: High Definition Digital Television. DTV television formats for 720p and 1080i resolutions in 16:9 aspect ratio images as originally established, although as explained above the CEA revised those so that a TV that can display an 810i 16x9 image is now considered as part of HDTV category.
MPEG-2: Moving Pictures Experts Group that designed the compression algorithm (-2) used in DTV broadcast transmissions, DVD, satellite transmission such as DirecTV, etc.
N/A: Not Available "at the time the report was produced".

Acronyms (cont.)

NTSC: National Television Systems Committee. Term also used to identify the current analog television system.
OTA: Over The Air DTV broadcasting. Digital signals tuned by a VHF/UHF antenna. This report sometimes uses the terms ATSC (the committee) or 8VSB (the tuning technology) to convey the same idea, although they are not the same.
POD: (Point Of Deployment interface) of the Host Interface License Agreement (PHILA) for cable tuners. Now called CableCARD.
PVR: Personal Video Recorder (recording on internal hard drive, HDD), also known as DVR and Tivo.
RGB: Analog connection for video, such as VGA 15 pin D-sub type of wire/connector (also used for computer monitors), or five BNC connectors.
RGBHV: See RGB.
SDTV: Standard Definition Digital Television. DTV television formats for 480i and 480p resolutions as originally established; now the term is used only for 480i digital (480p has been promoted to EDTV). See EDTV footnote.
STB: Also mentioned as HD-STB, Digital set to box to tune DTV via OTA, cable or satellite signals.
TTM: Time to Market, a term used on this report to identify when a product would be available.
TBA: To be announced later. The term is used when the manufacturer of a new product is not in a position to announce yet when a product would become available.
YPbPr: Analog component 3 wires connection. Also mentioned as component. Some component connections are only for 480p (DVD). HD enabled component connections should be specified as 720p/1080i or HDTV, otherwise, there might be a bandwidth limitation for HD signals, even when the connectors fit well.

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[1] **EDTV (cont):** When the CEA created the term there were a number of 4:3 TV sets that manufacturers called HDTVs but only showed 810i lines of a 16:9 1080i image (25% less in the vertical resolution); those TVs chose that design to maintain the rectangular wide-screen geometry of the HD image within the 4:3 frame of the TV, the remaining 270 lines (1080i minus 810i) of the TV set were used to scan top/bottom black bars instead of using them for the actual incoming image (also known as letterbox).

The new EDTV category was placed by the CEA between the originally approved SDTV and HDTV standards, but instead of putting those 4:3 sets on that EDTV category the CEA did the following: a) the 480p SDTV-only sets were promoted to the EDTV level, and b) the 810i (non-HDTV) 4:3 sets were promoted to the group of fully capable HDTV sets (720p or 1080i).

With time, manufacturers of 4:3 sets gradually designed those to adjust their scanning raster so they could show all the 1080i lines of incoming signal closer together, all within the displayed 16:9 image; in those TVs the black bars are dead space, the TV is not using resolution lines for the black bars (as opposed to the 810i style). It is recommended that consumers verify how a 4:3 TV handles 16:9 images before the purchase.

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